GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering

Level: Diploma

Branch: Mechanical Engineering / Mechanical Engineering (CAD/CAM)

Subject Code: DI04000271

Subject Name: Operations Management

w.e.f. Academic Year:	2025-26
Semester:	4th
Category of the Course:	Professional Elective – I

Prerequisite:	Basic understanding of mathematics, statistics, and engineering fundamentals**.** Prior exposure to engineering economics or manufacturing processes is helpful**.**
Rationale:	This course equips engineering students with the skills to design, manage, and optimize production and service operations for improved efficiency and quality. It builds a foundation for effective decision-making in real-world industrial and technological environments.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes
01	Define key concepts in operations management. Understand the role of operations in manufacturing and service organizations.
02	Apply operations management tools to design, analyze, and improve production systems.
03	Use forecasting, planning, scheduling, and inventory management techniques. Design and manage inventory systems.
04	Apply quality management and continuous improvement tools. Understand supply chain structures and logistics.

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+(PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial/ Practical		
L	T	PR	C	ESE(E)	PA(M)	PA(I)	ESE(V)	
3	0	2	3	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	%of Weightage
1.	**Introduction to Operations Management** • Definition, scope, and objectives of Operations Management. • Role of operations in manufacturing & service sectors. • Productivity: definition, factors affecting productivity, productivity improvement. • Operations strategy and decision-making. • Types of production systems: job, batch, mass, continuous, cellular, lean.	**5**	**10**
2.	**Product & Process Design** • Product development process and engineering involvement. • Value engineering & value analysis. • Product lifecycle and standardization. • Process design: process planning, process charts, flow diagrams. • Process selection: make-or-buy decisions. • Facility location: factors, location analysis techniques (qualitative & quantitative).Facility layout: types—process, product, fixed, cellular; layout planning tools.	**10**	**20**
3.	**Production Planning & Control (PPC), Forecasting & Capacity Planning** • Role of PPC in manufacturing. • Aggregate planning: strategies & methods. • Master Production Schedule (MPS). • Material Requirements Planning (MRP) & MRP-II. • Enterprise Resource Planning (ERP). • Scheduling: job scheduling (Gantt charts, priority rules), machine loading, sequencing (Johnson's rule). • Dispatching & follow-up.	**10**	**25**
4.	**Inventory Management** • Role of inventory, types of inventory, inventory costs. • Deterministic models: EOQ, EPQ, quantity discount models. • Probabilistic models: safety stock, service levels. • Inventory control systems: P-system, Q-system.	**10**	**20**

	• Selective control techniques: ABC, VED, FSN, HML, SDE analysis. • Just-In-Time (JIT) inventory systems and Kanban.		
5.	**Quality Management, Lean Operations & Supply Chain Management** • Basic concepts of quality, dimensions of quality. • Quality control tools: 7QC tools (Check sheet, Histogram, Pareto, Cause-effect, Control chart, Scatter diagram, Flowchart). • Statistical Process Control (SPC) basics. • Acceptance sampling plans. • Total Quality Management (TQM), Kaizen, 5S, Poka-Yoke. • Six Sigma: DMAIC process.	**10**	**25**
	Total	**45**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
26	43	31			

WhereR:Remember;U:Understanding;A:Application,N:AnalyzeandE:EvaluateC:Create(asper Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

Sr. No.	Book Title	Author(s)	Publisher	ISBN
1	Operations Management	William J. Stevenson	McGraw-Hill Education	978-9355322647 (mheducation.co.in)
2	Operations Management (International)	Nigel Slack, Alistair Brandon-Jones, Nicola Burgess	Pearson Education	978-1292408248 (Pearson)
3	Operations Management	William J. Stevenson	McGraw-Hill Education (13th/14th ed.)	978-1259667473 (Google Books)
4	Production and	S. N. Chary	McGraw-	978-9353164812

	Operations Management		Hill Education	(mheducation.co.in)
5	Production and Operations Management	R. Panneerselvam	PHI Learning / Prentice Hall of India	978-8120345553 (Scribd)
6	Operations Management	Rajesh Kumar R	Jyothis Publishers	978-9356803787 (Google Books)
7	Production and Operations Management	Chanchal Dey, Debasish Biswas, Nirmal Chandra Roy	Himalaya Publishing	978-93-5840-606-1 (Himalaya Publishing House)
8	Production and Operations Management	Everette E. Adam, Jr. & Ronald J. Ebert	Prentice Hall of India	(commonly cited classic title) (sanfoundry.com)
9	Factory Physics: Foundations of Manufacturing Management	Wallace J. Hopp & Mark L. Spearman	McGraw-Hill	0-256-15464-3 (en.wikipedia.org)

(b)Open source software and website:

Sr. No.	Resource Name	What It Covers	Free Web Link
1	NPTEL – Operations Management	PPC, forecasting, inventory, quality, SCM	https://nptel.ac.in/courses/110/106/110106062
2	MIT OpenCourseWare – Operations Management	Operations strategy, capacity, flow management	https://ocw.mit.edu/courses/15-761-operations-management-summer-2002
3	OpenStax – Management Principles	Inventory, forecasting, quality, productivity	https://openstax.org/details/books/principles-management
4	TutorialsPoint – Production & Operations Management	Production systems, layouts, PPC, JIT	https://www.tutorialspoint.com/production_and_operations_management
5	Khan Academy –	Regression, probability, forecasting tools	https://www.khanacademy.org/math/statistics-probability

	Statistics & Forecasting		
6	SAP Learning Hub	Basics of ERP, MRP, planning systems	https://learning.sap.com
7	ASQ – Quality Resources	7 QC tools, SPC, TQM, quality improvement	https://asq.org/quality-resources

Suggested Course Practical List:

Sr. No.	Title of Practical	Objective / Aim	Related Unit
1	Study of Types of Production Systems	To study job, batch, mass, continuous & cellular production systems with real industry examples.	Unit 1
2	Preparation of Process Chart & Flow Diagram	To develop Operation Process Chart (OPC) and Flow Process Chart (FPC) for a simple manufacturing/service activity.	Unit 2
3	Product Design & Value Engineering Exercise	To analyze a selected product and identify opportunities for value improvement and cost reduction.	Unit 2
4	Aggregate Planning & MPS Preparation	To prepare aggregate production plan and Master Production Schedule using given demand data.	Unit 3
5	MRP (Material Requirement Planning) Calculation	To prepare BOM, and calculate gross & net requirements and planned order releases.	Unit 3
6	Inventory Control using EOQ & ABC Analysis	To calculate EOQ and perform ABC classification using sample inventory data.	Unit 4
7	Application of 7 QC Tools	To collect sample data and prepare Histogram, Pareto Chart, Cause–Effect Diagram, Scatter Diagram, etc.	Unit 5
8	Study of Lean Tools – 5S, Kaizen & Kanban	To understand implementation of 5S, Kaizen and develop a simple Kanban card system.	Unit 5

List of Laboratory/Learning Resources Required:

Sr. No.	Practical Title	Laboratory / Learning Resources Required	Remarks (Combined Content)
1	Study of Types of Production Systems	• Case study documents	• List of industries • Charts showing types of production
2	Preparation of Process Chart & Flow Diagram	• Graph / A4 sheets	• Process chart symbols sheet • Stopwatch (optional)
3	Product Design & Value Engineering Exercise	• Sample product (bottle, chair, etc.)	• Value engineering worksheets • Measuring tools
4	Aggregate Planning & MPS Preparation	• Demand data sheets	• Calculator / spreadsheet software
5	MRP (Material Requirement Planning) Calculation	• BOM sheets	• Product structure diagrams
6	Inventory Control using EOQ & ABC Analysis	• Inventory data sheets	• EOQ formula sheets • ABC analysis templates
7	Application of 7 QC Tools	• Check sheet	• Graph sheets
8	Study of Lean Tools – 5S, Kaizen & Kanban	• 5S audit checklist	• Kanban card templates

Suggested ProjectList:

Sr. No.	Project Title	Brief Description	Related Syllabus Unit
1	Design & Analysis of an Optimized Facility Layout for a Small Workshop	Students redesign a workshop layout using process/product/cellular layout and improve material flow.	Unit 2 – Facility Layout
2	Development of a Production Planning & Control (PPC) System	Prepare MPS, Aggregate Plan, Scheduling (Gantt Chart), and Dispatching Sheets for a mini manufacturing unit.	Unit 3 – PPC & Scheduling
3	Inventory Optimization Using EOQ, ABC & VED Analysis	Conduct inventory survey and apply EOQ and selective inventory techniques to optimize	Unit 4 – Inventory

		stock.	Management
4	Quality Improvement Using 7 QC Tools	Identify defects in a process and apply Pareto, Histogram, Fishbone Diagram, Control Charts, etc.	Unit 5 – Quality Management
5	5S Implementation Project in Workshop / Laboratory	Implement Sort, Set-in-order, Shine, Standardize & Sustain in a real workspace with before–after results.	Unit 5 – Lean Operations
6	Value Engineering Study of an Everyday Product	Perform function analysis, cost analysis, and propose design or cost improvements.	Unit 2 – Value Engineering
7	Design of a Simple Kanban System for Material Movement	Create Kanban cards, reorder levels, and implement a pull-based system in workshop/lab.	Unit 4 & 5 – JIT / Lean
8	Forecasting & Demand Analysis for a Small Business	Use moving average, exponential smoothing, and trend analysis to predict future demand.	Unit 3 – Forecasting
9	Development of a Mini MRP System Using Spreadsheet	Create BOM, Product Structure Tree, and MRP Table (GR, NR, POR) in Excel.	Unit 3 – MRP, MRP-II
10	Study & Comparison of Production Systems in Local Industries	Prepare case studies of Job, Batch, Mass, Continuous, and Cellular production systems.	Unit 1 – Production Systems

Suggested Activities for Students:

Sr. No.	Suggested Activity	Description / Purpose	Related Syllabus Unit
1	Industrial Visit Report	Students visit a manufacturing/service industry and prepare a report on production system, layout, and workflow.	Unit 1 – Production Systems
2	Preparation of Process Charts	Students prepare Operation Process Chart (OPC) and Flow Process Chart (FPC) based on a chosen activity.	Unit 2 – Process Design
3	Value Engineering Case Study	Select a product and identify unnecessary costs, propose value-improving alternatives.	Unit 2 – Value Engineering
4	Mini Project on Scheduling	Prepare Gantt charts or scheduling sheets based on provided job data.	Unit 3 – Scheduling

5	Inventory Data Collection	Collect inventory data from workshop or nearby shop and perform ABC/EOQ analysis.	Unit 4 – Inventory Management
6	7 QC Tools Practice Assignment	Students collect sample data and prepare Pareto, Histogram, Fishbone, Scatter diagram, etc.	Unit 5 – Quality Tools
7	5S Audit of Workshop	Conduct a 5S survey, identify problems, and recommend improvements.	Unit 5 – Lean Management
8	Create a Mini Kanban System	Prepare Kanban cards for tools/materials used in workshop and demonstrate pull system.	Unit 5 – JIT & Lean
9	BOM & MRP Preparation Exercise	Students prepare a simple Bill of Materials and perform MRP calculations using Excel.	Unit 3 – MRP
10	Case Study on Supply Chain	Identify supply chain of a common product (mobile, pen, car part) and map all stages.	Unit 5 – Supply Chain Management

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