



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Bachelor of Engineering

Level: UG

Branch: Production / Manufacturing

Subject Code: BE05000601

Subject Name: Production and Operation Management

w. e. f. Academic Year:	2025-26
Semester:	5
Category of the Course:	Professional Core Course

Prerequisite:	Nil
Rationale:	Production and operations management involves the integration of numerous activities and processes to produce products and services in a highly competitive global environment. Many companies have experienced a decline in market share as a result of their inability to compete on the basis of product design, cost or quality. This course considers the operations from a managerial perspective. At the end of the course students will have a fair understanding of the role Production and Operations Management plays in business processes. Emphasis is given both to familiarization of various production processes and service systems, and to quantitative analysis of problems arising in the management of operations.

Course Outcomes:

Sr. No.	CO statement	Marks% weightage
CO-1	Explain the principles of operations management and their impact on product design and process planning.	25
CO-2	Analyze material requirements and implement suitable inventory control techniques for effective production management.	25
CO-3	Evaluate production scheduling methods to optimize resource utilization and minimize idle time, lead time, and production cost.	20
CO-4	Assess procurement, logistics, and distribution strategies for efficient supply chain management.	15
CO-5	Apply Lean, Agile, JIT, and World Class Manufacturing principles to enhance process efficiency and compare push and pull production systems.	15

Teaching and Examination Scheme:

Teaching / Learning Scheme (in Hours per semester)					Total Credits	Assessment Pattern and Marks					Total Marks
L	T	P	PBL	Total no of hours per semester		Theory		Tutorial / Practical			
						ESE (E)	PA / CA (M)	PA/C A (I)	PBL (I)	ESE (V)	
45	0	30	15	90	3	70	30	20	30	50	200

* *Problem-Based Learning (PBL) aims to accommodate learning beyond syllabus as per clause 9.4 of NBA manual.*



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Content:

Sr. No.	Content	Total Hrs
1	Operations Management: Definition of Operations Management; An Outline of Operations Strategy; Factors Affecting Operations Management; Objectives of Operations Management; Functions and Scope of Operations Management: Planning, Organizing, and Controlling; Manufacturing and Non-Manufacturing Operations and Their Classifications; Productivity and Factors Affecting Productivity.	6
2	Process Design and Planning (Manufacturing): Process Design: Meaning, Need, Factors, and Types; Framework for Process Design; Process Planning Procedure; Relationship between Process Planning and Other POM Activities; Types of Process Design.	6
3	Materials Planning and Control: Aggregate Planning Strategies and Methods, Forecasting: Types of Forecasting Methods, Factors affecting forecasting, Use of forecasting in different functional areas of management, Demand patterns and selection of forecasting techniques, Master Production Schedule (MPS), Materials Requirement Planning (MRP) Concept, Product Structure and Bill of Material, Lot sizing in MRP Systems – Minimum Cost per Period Method, period Order Quantity Method, Least Unit Cost Method, Part Period Balancing Method, Evolution from MRP to Manufacturing Resource Planning (MRP II).	6
5	Inventory control: Independent and Dependant Demands, Purchase Model with Instantaneous Replenishment (Without and Without Shortages), Manufacturing Model (With and Without shortages), Quantity Discounts, Fixed Order Quantity System, Periodic Review System, ABC, XYZ, VED, FSN and SDE Analysis.	6
4	Production Scheduling: Shop-Floor Control (Tools of Shop-Floor Control, Gantt charts), Improving Shop Performance. Single Machine Scheduling (Conditions/Assumptions of single machine scheduling, Definitions of Processing time, Ready Time, Due date, Completion time, Flow time, Lateness, Tardiness, Mean flow time, Mean tardiness, Shortest Processing Time (SPT) Rule to minimize mean flow rate, Weighted Mean flow rate, Earliest Due Date (EDD) Rule to minimize maximum lateness). Flow Shop Scheduling (Conditions/Assumptions of flow-shop scheduling, Johnson's Algorithm for 2 machines n jobs problems), Job Shop Scheduling (Introduction, Graphical solution of 2 jobs and M machines). Assembly Line Balancing: Assembly lines, Assembly line balancing, Splitting tasks, Flexible and U-shaped line layouts, Mixed model line balancing, Current thoughts on assembly lines, Computerized assembly line balancing.	9



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6	Supply Chain Management: Definitions of Supply Chain Management (SCM): Evolution, Nature, Concept and Relevance of SCM, Functions and Contributions of Supply Chain Management, Objectives of SCM; Value Chain: Supply Alliances, Purchasing, Logistics, Warehousing; Introduction of Information Technology in Supply Chain: E-Commerce, Electronic Data Interchange (EDI), Data Warehousing (DW), Radio Frequency Identification (RFID)	6
7	Contemporary Production Management Concepts: Business Process Reengineering, Lean, Agile and World Class Manufacturing (Basic Concept, Methodology, Characteristics, Applications), Operations Systems of the Future. Introduction to JIT Manufacturing Concept, Working of Kanban System, JIT Implementation Requirements, JIT Application in Different Environments, Push and Pull Manufacturing Comparison, JIT in Services.	6
TOTAL		45

Suggested Specification table with Marks (Theory): (For B.E. only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
15	20	25	20	10	10

R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

The syllabus of Production and Operation Management directly contributes to

SDG 4	Quality Education
SDG 8	Decent work and Economic growth
SDG 9	Industry Innovation and Infrastructure
SDG 12	Responsible Consumption and Production
SDG 13	Climate Action

Reference Books:

1. Production and Operations Management – Manufacturing and Services, Richard B. Chase, Nicholas J. Aquilano, F. Robert Jacobs, Tata McGraw- Hill Publishing Company Limited.
2. Production and Operations Management by R. Panneerselvam, Prentice – Hall of India Private Limited, New Delhi.
3. Operations Management – Strategy and Analysis, Lee J. Krajewski and Larry P. Ritzman, Pearson Education Asia (Addison-Wesley).
4. Modern Production/Operations Management, Elwood S. Buffa and Rakesh K. Sarin, Wiley Student Edition.
5. Production Operations Management, Adam E. Jr. and Ebert R. E., Edition, Pearson Education India.



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6. Operations Management, Dervitsiotis K. N., McGraw Hill International Book Co. Singapore.
7. Production & Operations Management Starr M. K., Thomson Business Information.

Standards and Act:

1. IS/ISO 9001:2015 → Quality Management
2. IS/ISO 22400 → Manufacturing KPIs
3. IS/ISO 28000 → Supply Chain
4. IS/ISO 8000 → Data Quality (MRP)
5. IS 14885 → Inventory Control
6. IS/ISO 3534 → Statistics
7. IS/ISO 18404 → Lean Manufacturing
8. IS/ISO 6385 → Ergonomics

List of Experiments:

1. Experiments of Productivity
2. Experiments of Process design for given component
3. Exercise problems on Sales forecasting techniques
4. Exercise on Materials planning
5. Exercise problems on Inventory control
6. Exercise on single machine production scheduling techniques
7. Exercise on Flow shop production scheduling techniques
8. Exercise on Assembly line balancing.
9. Exercise problems on Supply chain Management
10. Report on Information technology in supply chain management
11. Report on world class manufacturing systems
12. Report on Just in Time manufacturing system

Major Equipment:

Nil

List of Open Source Software

1. ERP-Next and Odoo
2. SAP S/4HANA
3. Epicor ERP

List of learning website:

1. <http://nptel.ac.in/courses/>

List of suggested activities for Problem-based Learning (PBL):

Sr. No	PBL category	Name of the activity	No. of hours	Evaluation Criteria
1.	Complex Problem-Solving targeting relevant SDGs /	Mini Project	15h (need to be changed as per total PBL hours)	Based on the novelty of project, technical understanding, report



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	Mini Project			quality and presentation
2.	Case Study Analysis / Seminar	Seminar	15h (need to be changed as per total PBL hours)	Based on the quality of report and presentation, technical understanding
3.	Micro project	Micro project	8h (need to be changed as per total PBL hours)	Based on the novelty of project, technical understanding, quality of report and demonstration
4.	Industry/Research laboratory visit	Industry/Research laboratory visit	Visit = 5h, Report preparation = 5h Total = 10h	Based on report submitted. Report should contain observations and calculations based on industry/ lab data.
5.	Video Based Learning	Technical video-based learning related to the subject	Duration of video = 5h Report preparation = 5h Total = 10h	Report /presentation based on the video learning outcomes.
6.	Assignment / Technical Writing / Research Writing	Assignment writing. Numerical based assignment is preferable.	5 assignments of 4 h each Total = 20h	Based on the correctness of submitted assignment
7.	Group Discussion / Quiz / Simulation	Problem solving/Coding using C, C++, MATLAB, Python, SCILAB, modeling and Analysis software or any other software	5 small coding-based assignment of 2h each Total = 10h	Based on the coding solution submitted.
8.	Video Based Learning	Self-learning online course	Minimum duration of the course should be 10h	Examination based assessment at the end of course. Based on the certificate produced.
9.	Complex Problem-Solving targeting relevant SDGs / Mini Project	Identification and solution of Complex problem	Maximum 2 problems. Study of the problem and solution finding, Total = 10h	Based on the depth of the solution submitted.
10.	Video Based Learning	Videos on Industrial safety/Disaster Management aspects based on subject	Duration of video = 5h Report preparation = 5h Total = 10h	Based on quiz/report submitted
11.	Research Paper Review / Analysis	Technical paper reading and summarization of research papers based on relevant subject	5 research papers = 20h	Summarize research paper and evaluation critical parameters



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12.	Poster / Chart / PowerPoint presentation	Poster/chart/power point preparation on technical topics	Duration = 6h	Based on poster/chart preparation and presentation skills
13.	Industry/Research laboratory visit	Industrial exposure for 2-3 days to observe and provide tentative solutions on society/environment/health/sustainability/any other issue	Duration = 15h for industrial exposure Problem identification and tentative solution = 10h Total = 20h	Based on evaluation of critical problems and solutions
14.	Group Discussion / Quiz / Simulation	Group Discussion on emerging/trending technical topics based on subject	Duration = 1h – 3h per topic	Based on performance in group discussion, technical depth, knowledge etc.
15.	Case Study Analysis / Seminar	Real world case studies-based learning	Duration of data collection/study = 5h Report preparation = 5h Total = 10h	Based on in-depth study, technical depth, data collected, fact finding, etc.
16.	Group Discussion / Quiz / Simulation	Application/Software development	Duration = 10h	Depending on the complexity of the Application/Software
17.	Assignment / Technical Writing / Research Writing	Research paper publication	Duration = 10h	Based on submission of proof of publication
18.	Micro project	Upgradation/Reverse engineering studies of existing equipment of the laboratory	Duration 10h	Based on the performance of the equipment
19.	Industry/Research laboratory visit	Expert lecture/session	Duration 3h For attending the lecture/session– 2h and for report writing 1h	Based on the proof of attendance and report submitted
20.	Video Based Learning	Annotated Video Explanation of Concept/Problem	10h (Preparation + Recording + Submission)	Based on accuracy of explanation, clarity, and presentation style.
21.	Assignment / Technical Writing / Research Writing	Patent Search and Innovation Gap Identification	10h (Search + Report)	Based on number of relevant patents analyzed and identification of innovation scope.
22.	Assignment / Technical Writing /	Preparation of a report on Indian Standard(s)	10h (study of Indian Standard(s))	Based on report quality and understanding of the



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	Research Writing		+ report	relevant Indian Standard(s).
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Note:

1. In alignment with Outcome-Based Education (OBE) and NBA accreditation requirements, the subject **Production and Operation Management compulsorily incorporates Micro Project and 5 marks as PBL activities for PEC.**

These activities are incorporated as integral Project-Based Learning (PBL) components. These activities are designed to foster experiential learning, encourage innovation, and strengthen problem-solving skills by engaging students in practical applications of power converter design, simulation, and analysis. The inclusion of PBL ensures that learners develop higher-order cognitive abilities mapped to Bloom's taxonomy, while simultaneously enhancing teamwork, communication, and research competencies essential for professional engineering practice.

2. The hours allocated to specific activities should be proportionate to the total no. of PBL hours and marks.
3. All the suggested activity should be related to the subject.
4. The number of hours is suggestive. Faculty can sub-divide the number of hours based on the activity. However, total number of hours are fixed.
5. Rubrics for the evaluation can be prepared by the faculty.
6. Subject teacher can add the relevant activities other than those listed above, with the consent of head of the department and DQAC.
