

# GUJARAT TECHNOLOGICAL UNIVERSITY

## MECHANICAL (INDUSTRIAL ENGINEERING) (46)

OPERATIONS PLANNING AND CONTROL TECHNIQUES

**SUBJECT CODE: 3714610**

SEMESTER: I

**Type of course:** Program Elective II

**Prerequisite:**

**Rationale:** The aim of this course is to make students understand and appreciate the importance of demand forecasting and demand management of products. Students can get acquainted with different inventory models and inventory analysis. The course is also aimed at imparting knowledge of Theory of Constraints.

**Teaching and Examination Scheme:**

| Teaching Scheme |   |   | Credits<br>C | Examination Marks |        |                 |        | Total<br>Marks |
|-----------------|---|---|--------------|-------------------|--------|-----------------|--------|----------------|
| L               | T | P |              | Theory Marks      |        | Practical Marks |        |                |
|                 |   |   |              | ESE(E)            | PA (M) | PA (V)          | PA (I) |                |
| 3               | 0 | 2 | 4            | 70                | 30     | 30              | 20     | 150            |

**Contents:**

| Sr. No. | Topic  | Total Hours | % Weightage |
|---------|--|-------------|-------------|
| 1       | <b>Introduction:</b> Basic Concept of Manufacturing Planning and Control System(MPC), Challenges of MPC System, Manufacturing Management Decisions, MPC Framework, Integrated Manufacturing and Management Systems   | 02          | 06          |
| 2       | <b>Demand Management and Forecasting:</b> Components of Demand, Types of Demands, Types of Forecasting Methods, Factors affecting forecasting, Use of forecasting in different functional areas of management, Demand patterns and selection of forecasting techniques, Measures of forecast accuracy [Mean Absolute Deviation (MAD), Mean Square Error (MSE), Mean Forecast Error (MFE), Mean Absolute Percent Error (MAPE)], Forecasting Methods (Quantitative and Qualitative), Simple Moving Average, Weighted Moving Average, Single Exponential Smoothing, Double Moving Average, Double Exponential Smoothing, Simple Regression, Semi-average Method, Multiple Regression, Delphi Method, Market Survey, Historical Analogy and Life Cycle analysis, Scenario Based Forecasting. | 12          | 28          |
| 3       | <b>Production and Materials Planning:</b> Functions, Objectives and Phases of Production Planning & Control (PPC), Aggregate Planning Strategies and Methods, Master Production Schedule (MPS), Materials Requirement Planning (MRP) Concept, Product Structure and Bill of Material, Lot sizing in MRP Systems – Minimum Cost per Period  | 10          | 24          |

|   |   |    |     |
|---|---|----|-----|
|   | Method, Period Order Quantity Method, Least Unit Cost Method, Part Period Balancing Method, Evolution from MRP to Manufacturing Resource Planning (MRP II) – Closed Loop Concept.   |    |     |
| 4 | <b>Inventory and Shop –Floor Control:</b> 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, Shop-Floor Control (Tools of Shop-Floor Control, Gantt charts), Improving Shop Performance. | 12 | 28  |
| 5 | <b>Synchronous Manufacturing and Theory of Constraints:</b> Concept of Synchronous Manufacturing, Hockey-Stick Phenomenon, Business Performance Measurements, Unbalanced Capacity, Bottlenecks and Capacity –Constrained Resources, Methods for Control, Drum-Buffer-Rope Analogy for Control, Comparing Synchronous Manufacturing with MRP and JIT, “VAT”  | 06 | 14  |
|   |   | 42 | 100 |

#### 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. Manufacturing Planning and Control Systems, Thomas E. Vollman, William L. Berry, D. Clay
4. Whybark, Galgotia Publications (P) Ltd. (The Irwin Series in Quantitative analysis for Business)
5. Operations Management – Strategy and Analysis, Lee J. Krajewski and Larry P. Ritzman, Pearson Education Asia (Addison-Wesley).
6. Modern Production/Operations Management, Elwood S. Buffa and Rakesh K. Sarin, Wiley Student Edition.
7. Production System, Planning, Analysis and Control, J L Riggs,
8. Production Planning and Inventory Control, Seetharama L. Narasimhan, Dennis W. McLeavy and Peter J. Billington, Prentice-Hall of India Pvt. Ltd., New Delhi.
9. Analysis and Control of Production Systems, Elsayed A. Elsayed and Thomas O. Bouche, Prentice Hall Publication.
10. Operations Management, Monks J.GJohn, John Wiley
11. Production and Inventory Management, Y A. C. Hax and D. Candea Prentice-Hall, Englewood Cliffs, NJ.

#### Course Outcome:

After learning the course the students should be able to...

- 1) Understand the concepts of demand forecasting and forecasting errors.
- 2) Understand and able to apply Demand Management methods.
- 3) Understand and appreciate Production Planning and Control activities.
- 4) Get acquainted to MRP, MRP-II, and ERP concepts.
- 5) Know about various material inventory models.
- 6) Understand and able to carry out inventory analysis.
- 7) Understand the concepts of Synchronous Manufacturing and Theory of Constraints.

**List of Experiments:**

- 1) Study of Manufacturing Planning and Control system.
- 2) Exercise on Demand Forecasting and Forecasting errors.
- 3) Exercise on Demand Management methods.
- 4) Study the aspects of Production Planning and Control.
- 5) Exercise on Material Requirement Planning and Manufacturing Requirement Planning.
- 6) Exercise on various Inventory models.
- 7) Exercise on different Inventory Analysis methods.
- 8) Study of Synchronous Manufacturing and Theory of Constraints Concepts - Bottleneck and capacity constrained resources, Drum-Buffer-Rope Analogy and Hockey stick phenomenon.