INDUSTRIAL ENGINEERING AND MANAGEMENT

ENME 351

Lecture	**: 3**	**Year : III**
Tutorial	**: 1**	**Part : II**
Practical	**: 0**	

Course Objectives:

The objective of this course is to provide students with a strong foundation in the principles and practices of industrial engineering and management, enabling them to analyze, design, and optimize production and operational systems. The course emphasizes the application of modern tools and techniques in production planning, forecasting, inventory control, maintenance management, and quality assurance to improve productivity, operational efficiency, and informed decision-making in industrial and organizational environments.

1 Industrial Engineering and Production System Design (10 hours)

- 1.1 Industrial engineering (IE)
  - 1.1.1 Evolution of technology and production systems
  - 1.1.2 Systems approach and productivity concepts
  - 1.1.3 Role of IE in modern industries
- 1.2 Plant location and layout
  - 1.2.1 Locational analysis
  - 1.2.2 Factors affecting plant location
  - 1.2.3 Location decision models: Factor rating, center of gravity
  - 1.2.4 Types of factory building
  - 1.2.5 Types of layouts and their applications
  - 1.2.6 Flow patterns and optimization
  - 1.2.7 Line balancing
- 1.3 Material handling systems
  - 1.3.1 Principles of material handling
  - 1.3.2 Classification of material handling equipment
  - 1.3.3 Equipment selection and cost considerations
  - 1.3.4 Automation in material handling and their types

2 Production Planning and Control (10 hours)

- 2.1 Functions of production planning and control
- 2.2 Production systems
  - 2.2.1 Job production
  - 2.2.2 Batch production
  - 2.2.3 Continuous production

2.3 Routing, scheduling and loading
- 2.3.1 Routing: Procedure and advantages
- 2.3.2 Scheduling and factors affecting scheduling
- 2.3.3 Loading and dispatching

2.4 Process planning and product design
- 2.4.1 Process selection and sequencing
- 2.4.2 Design for manufacturability (DFM)
- 2.4.3 Standardization and simplification

2.5 Aggregate planning and capacity planning
2.6 Introduction to MIS application and ERP systems
2.7 Smart manufacturing and industry 4.0

3 Scheduling and Project Management (4 hours)

3.1 Gantt charts
3.2 Network models: CPM and PERT
3.3 Critical path analysis and time-cost trade-off

4 Inventory and Supply Chain Management (4 hours)

4.1 EOQ and probabilistic models
4.2 Safety stock and service level
4.3 ABC and multi-criteria classification
4.4 Supply chain concepts

5 Material Requirement Planning and Lean Systems (4 hours)

5.1 MRP I and MRP II
5.2 Just-In-Time (JIT) and Kanban
5.3 Lean manufacturing principles
5.4 Comparison: MRP and JIT

6 Forecasting and Data-Driven Decision Making (4 hours)

6.1 Qualitative and quantitative forecasting methods
6.2 Time series models and regression analysis
6.3 Forecast accuracy and error metrics
6.4 Role of analytics in forecasting

7 Maintenance and Reliability Engineering (4 hours)

7.1 Types of maintenance
7.2 Maintenance strategies (Reactive, preventive, predictive)
7.3 Total Productive Maintenance (TPM)
7.4 Reliability concepts (MTBF, MTTR)

8 Quality Management and Continuous Improvement (5 hours)

8.1 Definitions and perspective on quality
8.2 Evolution of quality (Deming, Juran, Crosby)
8.3 Total Quality Management (TQM)
8.4 Quality management systems (QMS), standards (ISO 9001), documentation control, audits and compliance
8.5 Statistical quality control: Tools and data analysis
8.6 Six Sigma, Kaizen, lean management and PDCA cycle concepts

Tutorial (15 hours)

1. Numerical problems related to plant location
2. Calculations related to plant capacity
3. Project scheduling exercises using CPM and PERT techniques
4. Numerical problems on economic order quantity
5. Numerical problems on forecasting techniques
6. Statistical quality control applications and interpretation
7. Case studies and group presentation (Toyota production system, lean manufacturing)

Final Exam

The questions will cover all the chapters in the syllabus. The evaluation scheme will be as indicated in the table below:

Chapter	Hours	Mark distribution*
1	10	12
2	10	12
3	4	6
4	4	6
5	4	6
6	4	6
7	4	6
8	5	6
Total	**45**	**60**

* There may be minor deviation in marks distribution.

References

1. Mahajan, M. S. (2019). Industrial organization and management. Nirali Prakashan.
2. Mahajan, M. (2015). Industrial engineering and production management. Dhanpat Rai & Co.
3. Verma, A. P. (2010). Industrial engineering and management. S. K. Kataria & Sons.
4. Buffa, E. S., Sarin, R. K. (1987). Modern production/operations management (Latest Edition). Wiley.

5. Sadagopan, S. (1997). Management information systems (Latest Edition). Prentice Hall of India.
6. Niebel, B. W., Freivalds, A. (2014). Methods, standards, and work design. McGraw-Hill Education.
7. Stevenson, W. J. (2021). Operations management. McGraw-Hill Education.
8. Heizer, J., Render, B., Munson, C. (2020). Operations management. Pearson.
9. Ohno, T. (1988). Toyota production system: Beyond large-scale production (Latest Edition). Productivity Press.
10. Montgomery, D. C. (2019). Introduction to statistical quality control. Wiley.