

# MET-4210: SMART MANUFACTURING ERP SYSTEMS

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## Cuyahoga Community College

**Viewing: MET-4210 : Smart Manufacturing ERP Systems**

**Board of Trustees:**

January 2024

**Academic Term:**

Fall 2024

**Subject Code**

MET - Mech Eng/Manuf Ind Eng Tech

**Course Number:**

4210

**Title:**

Smart Manufacturing ERP Systems

**Catalog Description:**

Examines how companies manage processes to produce the product or services to satisfy customer requirements. Includes overview of Enterprise Resource Planning (ERP) software systems and their role within an organization with technology integration in smart production. Also covers cross-enterprise integration of the physical and virtual systems among various functions including operation strategy, process design, capacity planning, facility location and design, forecasting, production scheduling, inventory control and supply chain management. Hands-on lab activities will guide students through various business processes in specific ERP software products.

**Credit Hour(s):**

4

**Lecture Hour(s):**

2

**Lab Hour(s):**

4

## Requisites

**Prerequisite and Corequisite**

MET-2450 Robotics and Automation in Smart Manufacturing.

## Outcomes

**Course Outcome(s):**

Apply knowledge and methods from the advanced science of industrial engineering to model, evaluate and improve industrial processes and systems in relation with company operating efficiency and customer service.

**Essential Learning Outcome Mapping:**

Not Applicable: No Essential Learning Outcomes mapped. This course does not require application-level assignments that demonstrate mastery in any of the Essential Learning Outcomes.

**Objective(s):**

1. Apply the basics of linear programming and its application to operations management
2. Apply principles, steps involved, and methods /models of forecasting
3. Examine the different types and uses of inventory
4. Calculate inventory performance measures, order quantities, and total cost associated with inventory
5. Explain different kinds of scheduling operations, scheduling techniques, and shop loading methods.
6. Develop schedule using priority rules and calculate scheduling performance measures.
7. Explain capacity planning and location analysis, apply the relationship of capacity planning and location, and discuss the relationship between capacity planning and location analysis.

8. Organize and understand layout planning, types of layouts, steps involving in designing a layout, and explain its importance.
9. Discuss the supply chain and its components, role of warehouse, supply chain performance measures, and current trends

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**Course Outcome(s):**

Apply Industry 4.0 and utilize technology integration in smart production for real time data analytics and software systems to support planning, scheduling and control of smart production processes and systems.

**Essential Learning Outcome Mapping:**

Not Applicable: No Essential Learning Outcomes mapped. This course does not require application-level assignments that demonstrate mastery in any of the Essential Learning Outcomes.

**Objective(s):**

1. Explain the role of operation management in business.
2. Identify major historical development and current trends in operation management.
3. Examine basic concepts of Manufacturing Operations Management (MOM)/ Manufacturing Execution System (MES) for Industry 4.0.
4. Perform automatic data retrieval from an IoT system that utilizes smart devices, sensors and cloud service.
5. Implement forecasting model under real-time situation.
6. Analyze forecasting model using real-time data updates and adjust forecasting model to match with real-time demand.
7. Utilize real-time data for inventory management and control of real-time scenario.
8. Examine shop floor control and advanced scheduling techniques when real-time data are updated.

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**Course Outcome(s):**

Manage an enterprise using an ERP system and be able to use data analytics to make effective business decisions and evaluate the results.

**Essential Learning Outcome Mapping:**

Not Applicable: No Essential Learning Outcomes mapped. This course does not require application-level assignments that demonstrate mastery in any of the Essential Learning Outcomes.

**Objective(s):**

1. Evaluate the evolution, benefits and cost of ERP systems
2. Provide overview and objectives and operating logic of Material Requirement Planning (MRP) and Capacity Resource Planning (CRP)
3. Develop an integrated planning system including aggregated planning, Master Production Schedule (MPS), MRP, and CRP by utilizing real-time data.
4. Apply OM techniques in ERP system simulations and decision making

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**Methods of Evaluation:**

1. Tests
2. Quizzes
3. Labs
4. Home Works

**Course Content Outline:**

1. Introduction to operations management
  - a. What is operations management
  - b. Difference between manufacturing and service organization
  - c. Today's OM environment in practice
  - d. Introduction of optimization and optimization models
2. Supply Chain Management
  - a. The concept of supply chain management
  - b. The supply chain technology systems
  - c. The role of logistics in supply chain management

- d. Logistic planning
  - e. Distribution and warehouse management
  - f. Integrated supply chain management
  - g. Packaging, handling and transportation
  - h. Network design
  - i. Measuring performance
3. Forecasting
    - a. Principles of forecasting
    - b. Types of forecasting methods
    - c. Time series models/Casual models
    - d. Use of forecasting software to forecast
  4. Capacity planning and Facility allocation
    - a. Capacity planning in ER
    - b. Making capacity planning decisions
    - c. Location analysis
  5. Facility layout
    - a. What is layout planning
    - b. Types of layouts
    - c. Designing process layouts and product layouts
  6. Inventory Management
    - a. Types of inventory and objective of inventory management
    - b. Relevant inventory costs
    - c. Mathematical models for determining order quantity and inventory models
  7. Scheduling
    - a. Scheduling operations
    - b. Understand the flow operations
    - c. Low-volume operations and high-volume operations
    - d. How to sequence jobs, priority rules and scheduling bottlenecks
    - e. Theory of constraints
  8. Resource Planning
    - a. Enterprise resource planning
    - b. The evolution of ERP
    - c. The benefits and cost of ERP systems
    - d. Material planning systems
    - e. An overview of MRP
    - f. MRP inputs
    - g. Types of demand
    - h. Role of capacity requirements planning
    - i. Case studies and projects

## Resources

Dan Reid and Nada Sanders. *Operations Management: An Integrated Approach*. 7. 2019.

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Roberta S. Russell, Bernard W. Taylor. *Operations and Supply Chain Management*. 11th. 2023.

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Sagegg, Odd Jøran and Erlend Alfnes. *ERP Systems for Manufacturing Supply Chains: Applications, Configuration, and Performance*. 1st. CRC Press, 2020.

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