



### **Course Description**

#### **ETI1644 | Advanced Manufacturing Supply Chain | 3.00 credits**

This course is designed to provide students who are preparing to be manufacturing support technologists with the fundamental concepts of advanced manufacturing supply chain management (SCM) principles. Students will learn how to use manufacturing planning and control systems to coordinate material, labor, capacity and other resources to optimize manufacturing operations. Students also learn the key features of automated systems that can be used to manage the supply chain process.

### **Course Competencies**

**Competency 1:** The student will demonstrate an understanding of the relationship between various organizational functions in creating an effective supply chain management (SCM) system by:

1. Identifying common terms used in supply chain management
2. Defining inputs and outputs of a manufacturing supply chain and evaluating how efficient operations, better planning, improved forecasting and speed of delivery can enhance a company's competitive edge
3. Comparing the flow of product and services to the flow of demand and design information
4. Discussing the importance of effective internal (intra-departmental) communications and the need for continual open external (i.e. suppliers and customers) communications in a well-designed SCM system
5. Comparing the impact of various process layouts on managing the supply chain
6. Evaluating the advantages and disadvantages of various production plan strategies
7. Discussing the impact of the internet and globalization on SCM

**Competency 2:** The student will demonstrate the understanding of how to utilize manufacturing planning and control systems to create plans to balance marketplace demands by:

1. Describing the five major levels in the manufacturing planning and control (MPC) system
2. Creating resource plans by defining resource needs and coordinating with existing capacity and production plans
3. Detailing how information from Material Requirements Planning (MRP) is used to create the master production schedule (MPS)
4. Analyzing and reviewing the information needed to create a master production schedule (MPS)
5. Evaluating advantages and disadvantages of different production strategies: i.e., chase strategy, production leveling, and subcontracting
6. Comparing available capacity of the work center to the requirements of the MPS and determining how to refine plans to ensure optimal production
7. Discussing the role of a material requirements planner and tools used to analyze data for decision making
8. Solving problems that include determining due dates/times and calculating quantities of materials required for production plans
9. Discussing Enterprise Resource Planning (ERP) and highlighting key features of how the system is designed for effective management of the supply chain system

**Competency 3:** The student will demonstrate knowledge of production activity control (PAC) by:

1. Identifying activities of the PAC system as they relate to planning, implementation, and control
2. Determining the type of production control system to use based on the manufacturing process design
3. Implementing overlapping and splitting strategies to reduce manufacturing lead time (MLT)
4. Identifying bottlenecks and recommending alternative strategies to reduce lag time
5. Explaining the theory of constraints (bottlenecks) and queues and their effects on the production schedule
6. Discussing the importance of monitoring and controlling the work input and output of the work center
7. Evaluating the relationship between product design and process design and the potential cost associated with each

8. Describing how long-term cost benefits can be generated by incorporating continuous process improvement (CPI) within the organization

**Competency 4:** The student will demonstrate an understanding of inventory management from the raw material stage to the customer delivery stage by:

1. Defining Economic-Order Quantity (EOQ) and Period Order Quantity (POQ)
2. Reviewing calculations to determine the advantages and disadvantages of quantity discounts
3. Explaining what factors are used to determine period order quantities
4. Defining quarantine and release system expectations to comply with regulatory requirements
5. Defining and contrasting three basic systems used to determine when to reorder to avoid a stockout
6. Clarifying differences between raw materials, excipients, and components
7. Examining rules for determining safety stock and safety lead time
8. Discussing the importance of establishing key relationships with suppliers and customers
9. Evaluating methods such as the two-bin system, Kanban system, and perpetual inventory record to determine when the order point is reached
10. Discussing the purpose of performing periodic audits of inventory records

**Competency 5:** The student will demonstrate an understanding of the principles of physical distribution management by:

1. Defining physical supply and physical distribution and distinguishing how the two differ
2. Researching various channels of distribution and the ways in which materials can be moved
3. Describing what is reverse logistics and why it provides benefits
4. Presenting the key interfaces between physical distribution, production, quality and marketing
5. Comparing and contrasting the different forms of transportation and the costs associated with each
6. Discussing how product packaging and unitization can reduce material handling cost
7. Describing methods to maintain physical control and security of inventory
8. Reviewing inventory records for accuracy and identifying causes of record errors

**Competency 6:** The student will demonstrate an understanding of just-in-time (JIT) concepts by:

1. Describing the just- in-time (JIT) philosophy
2. Defining and identifying causes of waste in each element of the product cycle
3. Analyzing the effect that a JIT environment has on manufacturing planning and control
4. Explaining the Kanban system and how it works towards process improvements
5. Defining lean production and describing the tools and concepts used under the JIT philosophy to increase the efficiency of manufacturing

**Competency 7:** The student will demonstrate knowledge of the impact of quality in supply chain management (SCM) by:

1. Identifying the costs associated with quality
2. Presenting the types of variation and sources of variability within a manufacturing process
3. Discussing the difference between performing product inspections versus developing process controls
4. Describing regulatory expectations, i.e., current Good Manufacturing Practices (GMP) of Food and Drug Administration (FDA) and other regulatory bodies and their impacts on SCM
5. Identifying types of discrepancies that warrant formal methods of documentation
6. Discussing the importance of selecting and auditing qualified vendors/suppliers for all aspects of the supply chain
7. Describing the role of quality agreements in maintaining high quality levels and strengthening business relationships
8. Analyzing and interpreting control charts to determine trends in process variations and quality characteristics
9. Explaining how to apply quality management practices and certifications to increase quality and reduce cost i.e. TM, ISO, Six Sigma, etc.

10. Identifying and comparing organizations that are considered 'best in class'

**Learning Outcomes:**

- Communicate effectively using listening, speaking, reading, and writing skills
- Solve problems using critical and creative thinking and scientific reasoning
- Use computer and emerging technologies effectively