H1 Understand How and Where Computers are used in Manufacturing

H1.1 List possible computer applications in manufacturing processes.

Performance Objective: The student will be able to list at least ten uses of computers in a manufacturing setting and to describe the function of each use.

COMPUTER APPLICATIONS IN MANUFACTURING
Documentation:
Accounting and purchasing
Parts inventory and tracking
Engineering instruction and procedure manuals
Employee training and record keeping
Payroll and record keeping documentation
Occupational injury and illness record keeping
Scheduling manufacturing processes & personnel and tracking their cost
Computer-aided design (CAD)
Computer-aided manufacturing (CAM) that assists the manufacturing process in the realm of milling and surfaces, lathes, punch presses, and electrical discharge machining (EDM).
Local Area Network (LAN) provides employees access to on-line information via computers within a building or site.
Wide Area Network (WAN) provides employees access to on-line information via computers among multiple buildings or sites.
E-mail - employees communicate via computer from site to site.
Computer-aided Process Planning (CAPP)- a collection of software that helps a design engineer plan the various steps and operations of a single engineering function or part.
Computer Aided Electronics (CAE)- used in the design of electronics.
Materials Requirements Planning (MRP)- collection of software modules that create valid schedules by simulating and recalculating on a continual basis so the production department knows precisely what is supposed to be made, what it takes to make it, what is in the inventory, and what else is needed.

H1.2 Analyze the effect of introducing computers into manufacturing processes.

Performance Objective: Given the above list of computer applications, the student will able to make a two-minute verbal presentation about how these computer applications have affected the work environment and manufacturing processes.

H1.3 Determine the impact on manufacturing personnel when computers are introduced into manufacturing processes.

Performance Objective: After studying the impact and changes produced by introducing computers into the workplace, the student will be able to state the ways manufacturing processes changed with new computer systems and discuss the effect these changes have had on employees.

COMPUTER IMPACT ON PERSONNEL	
Fear of job elimination	Broader communications
Training and learning	Interaction with other departments
New skills and knowledge	Reduces costs
Learning other systems	Work processes more efficiently
Literacy	

H2. Demonstrate Knowledge of Computer Software Applications in Manufacturing

H2.1 List computer software programs used in manufacturing processes.

Performance Objective: The student will be able to identify seven kinds of software used in the manufacturing environment and state their functions.

SOFTWARE USED IN MANUFACTURING
Local Area Network (LAN) provides employees access to on-line information via computers within a building or site.
Wide Area Network (WAN) provides employees access to on-line information via computers among multiple buildings or sites.
Computer Aided Design (CAD)- design of machinery and parts.
Word processing for development of engineering instructional and procedure manuals.
Databases for large files of frequently used data, such as MSDSs
E-mail- communication between employees at different locations.
Computer-aided Manufacturing (CAM) - applications for milling and surfaces, lathes, punch presses, and electrical discharge machining (EDM).
Materials Requirements Planning (MRP)- a collection of software that create valid schedules by simulating and recalculating on a continual basis so the production department knows precisely what is supposed to be made, what it takes to make it, what is in the inventory, and what is needed.
Computer Aided Electronics (CAE)- used in the design of electronics.
Spreadsheet software.
Statistical Processing software.
Computer-aided Process Planning (CAPP)- a collection of software that helps a design engineer plan the various steps and operations of a single engineering function or part.

H2.2 Demonstrate proficiency in listed software.

Performance Objective: Given software used extensively in manufacturing, the student will be able to recognize and use five kinds of software at an intermediate level as determined by the instructional materials.

Performance Objective: The student will be able to master basic skills necessary for computer operation.

H3. Understand How Production Rates are Determined

H3.1 List factors that may be used to determine production rates in manufacturing processes.

Performance Objective: The student will be able to list the factors involved in determining production rates.

DETERMINING MANUFACTURING PRODUCTION RATES	
1.	Cost of materials needed for manufacturing
2.	Supplier reliability
3.	Number of employees required to do all phases of the work
4.	Employee skills and training
5.	Quantity and kinds of machines, equipment and tools
6.	Cost of health care benefits and other employer-paid benefits
7.	Salaries of the employees
8.	Manufacturing time lost due to holidays, sick leave, absences, and workers compensation claim costs
9.	Cost of work subcontracted out to other companies
10.	Cost of owning or leasing and maintaining manufacturing facilities
11.	Scheduling of personnel and time required to accomplish each phase of manufacturing - process planning and master scheduling
12.	Cost of the finished product
13.	Sales forecasts
14.	Customer delivery
15.	Price asked for the finished product

H3.2 Calculate production rate in manufacturing processes.

Performance Objective: Given the necessary data for the factors that influence production rate, the student will be able to develop a model of manufacturing production processes and determine the rate of production to exceed 90% of a benchmark model using the same data.

HOW TO CALCULATE THE PRODUCTION RATE	
1.	Identify the company’s goals and objectives.
2.	Determine the quantity of products to be produced by the department.
3.	Estimate the manpower and skills needed for the job.
4.	Estimate the material needed and its cost.
5.	Estimate the other operating costs based on the workload, manpower, and materials estimates using a departmental budget from a previous project.
6.	Develop a tentative budget.
7.	Discuss it with the supervisor, the engineering people, and the accounting department, and revise according to their suggestions.

H3.3 Explain what role production rates play in manufacturing processes.

Performance Objective: Given the elements of the manufacturing processes, the student will be able to state the influence of each element on the rate of production.

ELEMENTS OF THE MANUFACTURING PROCESS	
Materials acquisition	Fabrication
Tooling	Assembly
Planning	Management
Inspection	Units in a production run
Design	Duration of the run
Engineering	Customer variations in the run
Training	

H3.4 Explain how changes in production rates affect manufacturing processes.

Performance Objective: Given a specific manufacturing process, the student will be able to state the influence that an increase or decrease in the rate of production has on that process and the effect to costs and profits.

PRODUCTION RATES INFLUENCE OF MANUFACTURING PROCESS	
Employee head count costs	Increased profit over time
Sustained employment	Inventory costs
Physical facilities costs	Customer satisfaction
Equipment/machines costs	Product quality

H4. Understand Inventory Control, Material Forecasting and Capacity Planning

H4.1 List various methods of tracking inventory quantities.

Performance Objective: The student will be able to define the three kinds of inventory, what department in manufacturing is likely to track it, and recommend a method for tracking.

INVENTORY -THREE CATEGORIES
1. Finished goods (product)inventory
2. Work-in-process inventory (inventory actually in work or being stored in an incomplete state)
3. Raw materials inventory

TRACKED BY	TRACKED WITH
By job	Paper records - routing sheets
By process	Electronic software program
By supplier	
By customer	
By stores department	

H4.2 List factors that determine inventory demands.

Performance Objective: The student will be able to list ten factors that can affect inventory demands.

CHANGES IN INVENTORY DEMANDS
1. Increased production rate
2. Decreased production rate
3. Just-in-Time (JIT)inventory- enough inventory to satisfy immediate manufacturing needs
4. Reduced consumer response
5. Increased consumer response
6. Increased cost of raw materials
7. Decreased cost of raw materials
8. Increased cost of skilled personnel
9. Change in company goals and objectives
10. Change of suppliers
11. Engineering or process changes
12. Shortage of qualified suppliers

H4.3 Analyze inventory control, material forecasting, and capacity planning as components of a manufacturing plan.

Performance Objective: Given a rate of production and customer/market demands over some period of time, the student will be able to define and state how inventory control, material forecasting, and capacity planning are significant components in the business plan.

MANUFACTURING PLAN INCLUDES	
Facilities design	Number of operations
Lead time and setup	Sequence of operations
Raw material retrieval	Timing of operations
Warehouse or JIT	Cleaning
Initial inspection	Assembly
Production	Final inspection
Type of operations and equipment machinery, tooling, fixtures	

CAPACITY PLANNING IS A
1. corporate policy and competitive business strategy requiring the integration of all departments
2. based on the principles of quality improvement and a strong partnership with suppliers,
3. highly computerized CAPP and MRP system based on thorough tracking and data analysis, and
4. highly responsive to market/customer demands, for the most effective and efficient use of all resources

H4.4 Utilize inventory control, material forecasting, and capacity planning in the formation of a manufacturing plan.

Performance Objective: Given a product, a rate of production and customer demand or market analysis projection for the next six months, the student will be able to utilize inventory control, material forecasting, and capacity planning to create a manufacturing plan, including cost projections with a 90% accuracy when compared to a benchmark model.

PRODUCTION RATES INFLUENCE OF MANUFACTURING PLANNING	
Employee head count costs	Increased profit over time
Sustained employment	Inventory costs
Physical facilities costs	Customer satisfaction
Equipment/machines costs	Product quality

H5. Knowledge of Word Processing, Spreadsheets, Database, Statistical, and Graphic Software

H5.1 Utilize an industry-accepted word processing software package.

Performance Objective: Given a standard word processing package and information about a particular manufacturing operation, the student will be able to create, edit, spell check, grammar check, and format a technical document that delineates and explains the basic steps of the operation within five to ten pages.

Performance Objective: The student will be able to use and understand the limitations of a spell check function on a word processor.

H5.2 Utilize an industry-accepted spreadsheet package.

Performance Objective: Given a standard spreadsheet package, basic accounting categories, and an array of financial data, the student will be able to construct a financial statement by correctly entering the data using column totals and installing formulas so that the data is presented with 100% accuracy when compared to a benchmark model using the same data.

H5.3 Utilize an industry-accepted database software package.

Performance Objective: Given a standard database package, an array of data on shop accidents and injuries, and OSHA occupational injury and illness reporting requirements, the student will be able to construct a database such that the data can be retrieved to satisfy OSHA reporting.

H5.4 Utilize an industry-accepted statistical processing software package.

Performance Objective: Given a array of data on parts generated in a manufacturing process, the student will be able to use an industry-accepted statistical processing software package to identify degrees of variance within a given standard deviation and produce the appropriate charts to present the data.

H5.5 Utilize an industry-accepted graphic software package.

Performance Objective: Given the results of a statistical analysis of a manufacturing process, the student will be able to use a standard graphics software package to generate appropriate charts, tables, graphs, and other kinds of industry-related graphics to successfully present the data to a quality improvement team.

H6. Understand and Apply Budgeting and Master Scheduling Techniques

H6.1 List the steps taken when developing a manufacturing process budget.

Performance Objective: Given a business’s goals and objectives, a market forecast, production rate, and a manufacturing process, the student will be able to identify the steps in the development of a manufacturing process budget.

MANUFACTURING BUDGET STEPS	
1.	Identify its financial goals and objectives.
2.	Determine the quantity and cost of products.
3.	Estimate manpower/skills costs based on workload.
4.	Estimate cost of materials.
5.	Estimate other operating costs based on workload, manpower, training, and materials
6.	Estimate kind and quantity of equipment, costs, and depreciation.
7.	Estimate production time including learning curve.
8.	Develop a tentative budget.
9.	Teams adapt schedules, forecast material, and determine cost to customer.
10.	Set up computer tracking and evaluation systems to plan capacity.
11.	Maintain records of costs and plan capacity to incorporate data storage for inventory and materials.
12.	Work with all departments and revise the budget according to their suggestions.
13.	Track all inventory and costs, including the tracking of defective products on LAN and WAN systems.
14.	Continually improve manufacturing process, plan, and budget.

H6.2 Develop a manufacturing process budget.

Performance Objective: Given a product and a six-month manufacturing plan including rate of production and estimates of basic manufacturing costs, the student will be able to develop a monthly budget not to exceed the benchmark model more than 10%.

BASIC MANUFACTURING COSTS	
Labor costs	Inventory costs
Overhead costs	Training costs
Physical facilities costs	Management costs
Equipment/machines costs	

H6.3 Explain the importance of a master schedule for a manufacturing process.

Performance Objective: After studying three examples of master plans, the student will be able to develop a master schedule for a manufacturing process.

H6.4 Develop a master schedule for a manufacturing process.

Performance Objective: Given a product, the elements of the manufacturing process and time estimates for each element, the student will be able to develop a milestone chart that identifies the major steps from product design to first product delivery that is 90% accurate when compared to a benchmark model.

ELEMENTS OF THE MANUFACTURING PROCESS	
Suppliers	Assembly
Materials acquisition	Delivery
Tooling	Labor & human resources
Planning	Management
Inspection	Training
Design	Units in a production run
Engineering	Duration of the run
Fabrication	Customer variations in the run