Computer Integrated Manufacturing

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September 2020
Computer Integrated Manufacturing

Content	Skills	Learning Targets	Standards	Assessment	Resources & Technology
CEQ: **What is Computer Integrated Manufacturing?** UEQ **What is History of Manufacturing?** A. What is manufacturing and why is it important to our economy? B. What are the manufacturing procedures known as JIT, CIM, CAD, and lean manufacturing? C. What is kaizen and how is this technique used in manufacturing? D. What is the enterprise wheel and how does it illustrate a cohesive manufacturing procedure?	A. Explore manufacturing through research and projects. B.-C. Research a topic in manufacturing, develop a presentation, and present findings to a group. B.-C. Explain the different procedures used in manufacturing.	A. I can explore manufacturing through research and projects. B.-C. I can prepare a presentation for the class on a manufacturing topic. B.-C. I can list 5 different procedure used in manufacturing.		A. CSA- History of Manufacturing- Activity 1.1.1 A. CSA- Enterprise Wheel - Activity 1.1.2 B.-D.CFA- Prioject - Research Manufacturing -	PLTW Curriculum Computer Integrated Manufacturing (CIM)

UEQ **What are various Control Systems?** E. What are the benefits of using flowcharting in manufacturing? F. During which stage(s) of the design process is flowcharting used? G. Outside of design, in what other areas can flowcharting methods be applied? H. How can a control system be designed to make a transfer system function? I. What is the difference between open and closed loop systems?	D. Understand what the enterprise wheel represents and how it represents the overall manufacturing scheme. E. Identify basic flowcharting symbols and discuss their functions. F. Create a flowchart that portrays a manufacturing process. G. Apply flowcharting to areas other than manufacturing. H. Identify a control system and explain its application to manufacturing.	D. I can draw the enterprise wheel and label key components of it. E. I can draw 5 basic flowchart symbols. F. I can draw a flowchart that portrays a manufacturing process. G. I can list 3 ways a flowchart can be used in manufacturing other than design. H. I can identify a control system and explain its application to manufacturing.		1.1.3 E.-J.CSA- Inputs and Outputs - Activity 1.2.2 E.-J CSA- Basic Output Programming- Activity 1.2.3 E.-J CSA- Basic Input Programming- Activity 1.2.4	PLTW Curriculum Computer Integrated Manufacturing (CIM)

J. How is it possible to instruct a machine to interact with its surroundings and call attention if something goes wrong?	i.-J. Model and create a program to control an automated system.	I.-J I can model and create a program to control an automated system.		E.-J CSA- While & If-Else loops -Activity 1.2.5 E.-J CSA- Variables and Subroutines- Activity 1.2.6 E.-J CSA- pen/closed loop sytems- Activity 1.2.7 E.-J CFA- utomated Guided Vehicle- project 1.2.8	

October 2019
CIM

Content	Skills	Learning Targets	Assessment	Resources & Technology
UEQ: What is the Cost of Manufacturing? A. How can a system's cost be minimized without compromising quality?	A. Maximize the efficiency of the manufacturing system with respect to time and cost.	A. I can list 5 ways to maximize efficiency in manufacturing systems.	A. CSA- Cost overview- Activity 1.3.1 A.-B. CSA- Transfer	PLTW Curriculum Computer Integrated Manufacturing (CIM)

B. What safety factors should be considered when developing a control system? **UEQ:** **What is designing for Manufacturability?** C. What are some major causes of defects in products? D. How do safety and ethics affect product design? E. When performing a redesign or improving a product, why is it important to follow a design process? F. What properties are important when creating a	B. Compare the efficiency of running multiple systems against that of one large system. A.-B. Create a control system that replicates a factory cell. C. Use knowledge of design to analyze products with flaws. D. Use calculated volume, mass, surface area of parts to determine material cost, waste, and packaging requirements.	B. I can chart comparisons of multiple efficient systems. A.-B. I can create a control system that replicates a factory cell. C. I can use knowledge of design to analyze products with flaws. D. I can design packaging requirements efficiently. E. I can use solid modeling software to redesign flaws. F. I can determine whether	System - Activity 1.3.2 C. CSA- Design Flaws- Activity 2.1.1 D.-F CSA- ass Properties Analysis- Activity 2.1.2	PLTW Curriculum Computer Integrated Manufacturing (CIM)

new product? G. What restrictions must you consider when modeling a product?	E. Use solid modeling software to improve a flawed design. F. Determine whether a product is safe for a given audience (e.g., children under the age of three). G. Make ethical decisions about manufacturing. C.-G. Create a product using solid modeling software.	a product is safe for a given audience. G. I can list 5 ethical issues in manufacturing. C.- G. I can draw products using solid modeling software	G. CSA- Ethics and Safety- Activity 2.1.3 C.-G. CFA- Solid Modeling drawings	

November 2019
CIM

Content	Skills	Learning Targets	Assessment	Resources & Technology
UEQ: How do we make things? A. What are raw materials and how do we obtain them?	A.-B. Analyze a product to propose the manufacturing processes used to create it.	A.-B. I can analyze a product to propose the manufacturing processes used to create it.	A-E. CSA - Manufacturing process- Activity 2.2.2	PLTW Curriculum Computer Integrated Manufacturing

B. How do we produce industrial materials? C. What are common secondary manufacturing processes and how are they applied in manufacturing? D. What is the difference between conditioning, assembling, and finishing processes? E. What is the difference between forming and molding? F. What are some common forms of rapid prototyping, and how has this technique changed the manufacturing process?	C. Explain the difference between primary and secondary manufacturing processes. D.-E. Explore manufacturing processes via research. F. Explore prototyping processes.	C. I can list 3 differences between primary and secondary manufacturing processes. D.-E I can write a research paper about manufacturing processes. F. I can list 5 different methods of rapid prototyping.	F. CFA- Create a prototype- Activity 2.2.1 G. CSA- Introduction top machines - Activity 2.3.1	(CIM)

UEQ: **What is Product Development?** G. What types of machines exist to perform manufacturing processes? H. Why is it important for a design engineer to learn about programming codes? I. What are jigs and fixtures? How are they the same? How are they different? J. How has the advancement of technology and machines affected the global market? K. What are some ways that manufacturers can verify how a part will be created without producing it physically? L. How do machines receive data from a computer?	G. Identify machines when given a process and identify the process that a given machine performs. H. Determine the appropriate speed rate for a given material using a tool with a given diameter. H. Determine the feed rate for a given material using a tool with a given diameter. H. Read and interpret G & M codes. J. Transfer the drawings made in CAD to a CAM program. K. Create numerical code using a CAM program. K. Verify the creation of a part using a simulation software.	G. I can list 5 machines and their process given a specific process. H. I can program the proper speed rates for the necessary tooling. H. I can program the proper feed rates for the necessary tooling. H. I can manually write a G & M program to machine a part. J. I can draw a part in CAD and transfer it to a CAM program. K. I can create a G & M code from the CAM program. K. I can use the verify command to visually see the part before machining.	H. CSA- Speeds and feeds- Activity 2.3.2 I. - M. CSA- traight line Interpolation project 2.3.3a I. - M CSA- urved line Interpolation project 2.3.3b I. - M CFA- Design container- project 2.3.5	PLTW Curriculum Computer Integrated Manufacturing (CIM)

M. How are manufacturing companies affected by the way a product is created?	I. K.-M. Create parts using the machines demonstrated by the instructor. K.-M. Create a product on the computer using knowledge of manufacturing processes	K.-M. I can machine a part using the CNC machines.		

December 2019
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Content	Skills	Learning Targets	Assessment	Resources & Technology
UEQ: **What is to Robotic Automation?** A. What were some early technologies that helped facilitate the development of robots? B. What are some examples and uses of early robots? C. Why are robots used in industry?	A.-C. Research a topic in automation. B. Explore materials handling. D. Identify the advantages and disadvantages of	A.- C. I can research a given topic in automation. B. I can list 10 methods of material handling in automation. D. I can list 5 advantages and disadvantages of robotic labor versus human	A.- D. CSA-History of Automation- project 3.1.1 E. - F.CSA-Robot programming activities 3.1.2 - 3.1.4	PLTW Curriculum Computer Integrated Manufacturing (CIM)

D. What effect does the robot have on the human worker? E. What are the benefits of simulation software in industry? F. What situations require robots to communicate with machines?  UEQ: **What are elements of Automation Power?** G. What is work? H. What is power?	robotic labor versus human labor. D. Explore automation careers. E. Create and program virtual robotic work cells with simulation software. F. Program the interface between a robot and another machine. G. Identify the three main power types. H.-J. Solve problems involving electrical, pneumatic, and mechanical power.	labor D. I can explore automation careers. E. I can utilize Robocell software to program a virtual robot. F. I can program the robot and mill to handshake. G. I can list 3 main power types H.-J. I can design a mechanism involving electrical, pneumatic, and mechanical	G. CSA-Elements of Power- Activity 3.2.1 H.-J. CSA-Hydraulic Part feeder- project 3.2.3 H.-J. CSA-Pneumatic compressor construction - project 3.2.2	PLTW Curriculum Computer Integrated Manufacturing (CIM)

I. How is torque hrefated to power? J. Why is Ohm's Law important in finding electrical power?	H. Convert power between units. H. Solve problems involving fluid power. H. Construct a system to convert pneumatic power into mechanical power I. Calculate torque and use it to calculate power.	power. H. I can convert power between units. H. I can solve problems involving fluid power. H. I can construct a system to convert pneumatic power into mechanical power. I. I can calculate torque.		

January 2020
CIM

Content	Skills	Learning Targets	Assessment	Resources & Technology
UEQ: **What are Robotic Programming and Usages?** A. What is a microcontroller? B. What is the programming language for	A. Build the Lynxmotion robot if the robots are not already built.	A. I can build a Lynxmotion robot. B. I can program a	A. - E. CSA-Lynxmotion activities - 3.3.1 to 3.3.4 A.-E. CSA-Handshaking activities	PLTW Curriculum

the robot that you are using? C. What are the different types of loops and how are they used? D. What is the purpose of declaring variables and how are they used in programming? E. How does an engineer determine the size of a robot designed to perform a specific task?  UEQ: **What are different types of CIM Systems?** F. What is an FMS? G. What advantages do FMS systems have over mass production systems?	B. Learn the programming language needed to operate the Lynx robot. C. Create programs using robotic software that will allow the robot to perform a set of tasks. D. Configure servo motors to operate the Lynxmotion robot. E. Formulate a list of tasks in which the robot used in class can be used in a large scale CIM cell operation. A.-E. Utilize handshaking strategies to allow two or more similar or dissimilar devices to communicate and operate together. F. Identify the three categories of CIM systems.	Lynxmotion robot. C. I can create programs using robotic software that will allow the robot to perform a set of tasks. D. I can configure servo motors to operate the Lynxmotion robot. E. I can list 5 tasks that our small robots emulate in large scale. A.-E. I can utilize handshaking strategies to allow two or more similar or dissimilar devices to communicate and operate together. F. I can list 3 categories of	F.- I. CSA- anufacturing and Automation careers report 4.1.2 J. Manufacturing fieldtrip - 4.2.2	Computer Integrated Manufacturing (CIM) PLTW Curriculum Computer Integrated Manufacturing (CIM)

H. What components comprise an FMS? I. What is a process design chart? How can it help streamline a manufacturing process? J. What manufacturing or automation career(s) is appealing? 	G. Compare and contrast the benefits and drawbacks of the three categories of CIM systems. H. Identify the components of a FMS. I. Create a process design chart for a manufacturing process. J. Explore a manufacturing or automation career of interest and determine the appropriateness and steps required to be a professional in that role.	CIM systems. G. I can list 5 benefits and drawbacks of the three categories of CIM systems. H. I can list the 5 major components of a FMS. I. I can create a process design chart for a manufacturing process. J. I can explore a manufacturing or automation career of interest and determine the appropriateness and steps required to be a professional in that role.		

February 2020
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Content	Skills	Learning Targets	Assessment	Resources & Technology
UEQ: **What are the elements for** A. Identify the potential		A. I can list 5 safety issues		

Integration of Manufacturing? A. What safety issues are common in CIM systems? B. How do engineers choose power systems that will integrate within a CIM system? C. Which machine tools are necessary to fabricate the part or parts? D. What are the appropriate sensors to ensure quality parts and smooth process flow? E. How can a CIM system be automated?	safety issues with a CIM system and identify solutions for these problems. B. Understand the significance of teamwork and communication. C. Design a manufacturing system that contains at least two automated components. C. Complete the construction of each individual component of the miniature FMS and verify that each component works. C. Assemble components into a working miniature FMS. D. Refine each component to improve the total process flow and cycle time.	and identify there solution with a CIM system. B. I can work as a team and communicate with others to solve problems. C. I can design a manufacturing system that contains at least two automated components. C.I can construct and assemble each miniature component of an FMS. D. I can adjust components as needed to improve process flow and cycle time. A.-E. I can maintain a journal throughout all CIM coursework.	A.-C.CSA-Factory Systems problem 4.2.2 D. CSA- rocess Flow worksheet- Activity 4.2.1 A.-E. CSA-Engineering Journal	

	A.-E. Start and maintain a journal that documents daily work.			