Curriculum Framework – Computer Integrated Manufacturing
Unit 4 Integration of Manufacturing – Lesson 4.2 Integration of Manufacturing Elements

Desired Results *(stage 1)*

ESTABLISHED GOALS
It is expected that students will…

- G1 – Demonstrate an ability to identify, formulate, and solve engineering problems.
- G2 – Demonstrate an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- G3 – Demonstrate an ability to design and conduct experiments, as well as to analyze and interpret data.
- G4 – Demonstrate an ability to apply knowledge of mathematics, science, and engineering.

Transfer

TRANSFERS: *Students will be able to independently use their learning to …*

- T1 – Create a computational model to control a complex system. (NGSS Engineering Practice 5)
- T2 – Function effectively within a diverse team. (ABET 2014-2015, criterion 3d)
- T3 – Develop a complex model to manipulate and test of a proposed process. (NGSS Engineering Practice 2)

Meaning

UNDERSTANDINGS: *Students will understand that …*

- U1 – Process flow design has a major impact on overall production time and product profit.
- U2 – During the design and development process, flowcharting is used to plan and depict the detailed process flow for an entire system as well as all of its subsystems.
- U3 – Flowcharting can be used to illustrate the overall phases of the product development process.
- U4 – Proper sequencing of automated operations is important in factory design.
- U5 – Safe operating procedures must be addressed in a CIM environment at all times to avoid serious injury.
- U6 – Tradeoffs occur between efficiency and cost when choosing a manufacturing system.
- U7 – Engineers choose appropriate sensors to ensure high quality part production.

ESSENTIAL QUESTIONS: *Students will keep considering …*

- Q1 – How can a team be diversified to enhance a design process?
- Q2 – How does the design process used to optimize a solution to a problem?
- Q3 – How does the effectiveness of a presentation affect the acceptance of a solution?

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G5 – Demonstrate an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
G6 – Pursue the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
G7 – Demonstrate an understanding of professional and ethical responsibility.
G8 – Demonstrate an ability to function on multidisciplinary teams.
G9 – Demonstrate an ability to communicate effectively.
G10 – Gain knowledge of contemporary issues.
G11 – Recognize the need for, and develop an ability to engage in life-long learning.

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U8 – Identification of correct electrical and fluid power systems is required to complete the desired manufacturing system.

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KNOWLEDGE: Students will…

K1 – Recognize process symbols. U1, U2, U3, U4, U5
K2 – Identify the potential safety issues with a CIM system. U5
K3 – Identify how functions of a computer program can be applied to perform a task. U4, U6

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SKILLS: Students will…

S1 – Outline a process for a manufacturing process. U1, U2, U3, U4, U5
S2 – Design a system to manufacture a part. U1, U2, U3, U4, U5, U6, U7, U8
S3 – Construct a system to manufacture a part. U1, U2, U3, U4, U5, U6, U7, U8
S3 – Create a flowchart or pseudocode to perform a task. U1, U2, U3, U4, U5, U6, U7, U8
S4 – Construct a control program to accomplish a goal. U1, U2, U3, U4, U5, U6, U7, U8
S5 – Evaluate the effectiveness of a system to accomplish a goal. U1, U2, U3, U4, U5, U6, U7, U8
S6 – Identify strategies to resolve team conflict. U6

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Evidence *(stage 2)*			Learning Plan *(stage 3)*	
Activities (A) Projects (P) Problems(B)	Assessment FOR Learning	Assessment OF Learning	Activities (A) Projects (P) Problems(B)	Knowledge and Skills
4.2.1.A Process Flow	• Essential questions	• Accurate process diagram • Conclusion questions	4.2.1.A Process Flow	K1, S1
4.2.2.B Factory System (VEX)	• Essential questions • Engineering design process iterations • Program development documentation in engineering notebook • Demonstration of effective teamwork skills • Project rubric	• System physical construction • Number of sensors effectively used • Program psedocode • Program code • Performance of system to complete the objective • Demonstration of effective teamwork skills • Presentation of project • Project report • Project rubric	4.2.2.B Factory System (VEX)	K2, K3, S1, S2, S3, S4, S5, S6
4.2.2.B Factory System (FT)	• Essential questions • Engineering design process iterations • Program development documentation in engineering notebook • Demonstration of effective teamwork skills • Project rubric	• System physical construction • Number of sensors effectively used • Program flowchart • Program code • Performance of system to complete the objective • Demonstration of effective teamwork skills • Presentation of project • Project report	4.2.2.B Factory System (FT)	K2, K3, S1, S2, S3, S4, S5, S6

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		• Project rubric		

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