Curriculum Framework – Computer Integrated Manufacturing
Unit 3 Elements of Automation – Lesson 3.1 Introduction to Robotic Automation

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

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

- T1 – Research topics according to accepted academic standards and become a resource to others on a selected topic. (NGSS Engineering Practice 6)
- T2 – Develop a program and test its effectiveness. (NGSS Engineering Practice 2)

Meaning

UNDERSTANDINGS: *Students will understand that …*

- U1 – There are many factors that influence the evolution of automation.
- U2 – Robots are widely used in industry to assist in the production of manufactured goods.
- U3 – Robots have distinct advantages over humans in some industrial settings.
- U4 – A variety of automation careers exist.
- U5 – Robots and machines communicate and coordinate their activities through a process called handshaking.

ESSENTIAL QUESTIONS: *Students will keep considering …*

- Q1 – How is manufacturing affected by robots?
- Q2 – How can a simulation be used to design a physical system?

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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.	Acquisition ***KNOWLEDGE:*** *Students will…* • K1 – Identify common robot types. U1, U2, U3 • K2 – Define accuracy and repeatability. U3 • K3 – Describe components of a robotic work cell. U1, U3 • K4 – Describe roll angle. U3 • K5 – List characteristics of robots in a manufacturing environment. U2, U3, U4 • K6 – Describe methods for materials to be handled in a manufacturing environment. U2, U3, U4	***SKILLS:*** *Students will…* • S1 – Distinguish between accuracy and repeatability. U2, U3 • S2 – Describe the development of robot technology and application. U1, U2, U3, U4 • S3 – Create a program to control a robotic arm. U2, U3 • S4 – Calculate roll angle for robotic arm movement. U2, U3 • S5 – Create a program for robotic arm to communicate with another device. U2, U3, U5 • S6 – Analyze factors that impact robots in a manufacturing environment. U2, U3, U4 • S7 – Explain how materials handling impacts a manufacturing environment. U2, U3, U4

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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
3.1.1.P History of Automation	• Essential questions • Response to timeline label prompt • Research notes	• Presentation of research • Conclusion questions	3.1.1.P History of Automation	K1, S2
3.1.2a.A Pick and Place	• Essential questions	• Accuracy of the robot cell setup • Accuracy of the robot program • Conclusion questions	3.1.2a.A Pick and Place	K3, S3
3.1.2b.A Teaching Positions	• Essential questions	• Accuracy of the robot cell setup • Accuracy of the robot program • Conclusion questions	3.1.2b.A Teaching Positions	K2, S3
3.1.2c.A Stacking and Rolling	• Essential questions	• Accuracy of the robot cell setup • Accuracy of the robot program • Conclusion questions	3.1.2c.A Stacking and Rolling	K2, S3
3.1.2d.A Relative Positions	• Essential questions	• Accuracy of the robot cell setup • Accuracy of the robot program • Conclusion questions	3.1.2d.A Relative Positions	K3, K4, S3, S4
3.1.2e.A Go Circular	• Essential questions	• Accuracy of the robot cell setup • Accuracy of the robot program	3.1.2e.A Go Circular	K2, S3

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		• Conclusion questions		
3.1.2f.A Variable Programming	• Essential questions	• Accuracy of the robot cell setup • Accuracy of the robot program • Conclusion questions	3.1.2f.A Variable Programming	K2, S3
3.1.2g.A Pallet Storage	• Essential questions	• Accuracy of the robot cell setup	3.1.2g.A Pallet Storage	K2, S3
3.1.2h.A Handshaking	• Essential questions	• Accuracy of the robot program	3.1.2h.A Handshaking	K3, S3, S5
3.1.3.A Robots vs. Humans	• Essential questions • Responses to presentation question	• Conclusion questions	3.1.3.A Robots vs. Humans	K5, S6
3.1.4.A Material Handling	• Essential questions • Responses to presentation question	• Conclusion questions	3.1.4.A Material Handling	K6, S7

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