

Curriculum Framework – Computer Integrated Manufacturing

Unit 3 Elements of Automation – Lesson 3.2 Introduction to Automation Power

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 – Apply a design process to solve a problem. (NGSS Engineering Practice 6)
- T2 – Optimize a variety of factors within a complex system. (NGSS Engineering Practice 2)
- T3 – Develop a complex model to manipulate and test of a proposed process. (NGSS Engineering Practice 2)

Meaning

UNDERSTANDINGS: *Students will understand that ...*

- U1 – Power is produced in many ways and transmitted through various forms (e.g. electrical, pneumatic, hydraulic, and motion).
- U2 – Fluid power is inversely proportional to the area upon which the force is being applied.
- U3 – Pneumatics is one form of fluid power that can be used to operate machines and products.
- U4 – Sensors provide feedback to control systems and products used by consumers.

ESSENTIAL QUESTIONS: *Students will keep considering ...*

- Q1 – How can power be transformed into other forms?
- Q2 – How can a system be improved?
- Q3 – How can team effectiveness be improved?

<ul style="list-style-type: none"> • 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. 	<p style="text-align: center;">Acquisition</p> <p>KNOWLEDGE: <i>Students will...</i></p> <ul style="list-style-type: none"> • K1 – Define torque, pressure, work and power. U1, U2, U3 • K2 – Identify equations of torque, pressure, work and power. U1, U2, U3 	<p>SKILLS: <i>Students will...</i></p> <ul style="list-style-type: none"> • S1 – Apply torque, pressure, work and power equations to engineering problems. U1, U2, U3 • S2 – Design a system to perform a task using fluid power. U1, U2, U3, U4 • S3 – Construct a fluid power system. U1, U2, U3, U4 • S4 – Create a program to operate a fluid power system. U1, U2, U3, U4
--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Evidence (stage 2)		
Activities (A) Projects (P) Problems(B)	Assessment FOR Learning	Assessment OF Learning
3.2.1.A Elements of Power	<ul style="list-style-type: none"> • Essential questions • Use of correct formula • Correct calculation steps 	<ul style="list-style-type: none"> • Correct responses to power questions • Conclusion questions
3.2.2.A Compressor Construction (FT)	<ul style="list-style-type: none"> • Essential questions 	<ul style="list-style-type: none"> • Accurate physical construction • Conclusion questions
3.2.3a.B Hydraulic Feeder (VEX)	<ul style="list-style-type: none"> • Essential questions • Engineering design process iterations • Program development documentation in engineering notebook • Demonstration of effective teamwork skills • Project rubric 	<ul style="list-style-type: none"> • System physical construction • Number of sensors effectively used • Program pseudocode • Program code • Performance of system to complete the objective • Demonstration of effective teamwork skills • Appropriate safety plan • Total cost of the system • Presentation of project • Project report • Project rubric
3.2.3b.B Hydraulic Manipulator (VEX)	<ul style="list-style-type: none"> • Essential questions • Engineering design process iterations • Program development 	<ul style="list-style-type: none"> • System physical construction • Number of sensors effectively used • Program pseudocode

Learning Plan (stage 3)	
Activities (A) Projects (P) Problems(B)	Knowledge and Skills
3.2.1.A Elements of Power	K1, K2, S1
3.2.2.A Compressor Construction (FT)	S3
3.2.3a.B Hydraulic Feeder (VEX)	K1, K2, S1, S2, S3, S4
3.2.3b.B Hydraulic Manipulator (VEX)	K1, K2, S1, S2, S3, S4

	<ul style="list-style-type: none"> documentation in engineering notebook • Demonstration of effective teamwork skills • Project rubric 	<ul style="list-style-type: none"> • Program code • Performance of system to complete the objective • Demonstration of effective teamwork skills • Appropriate safety plan • Total cost of the system • Presentation of project • Project report • Project rubric 		
3.2.3a.B Pnuematic Part Feeder (FT)	<ul style="list-style-type: none"> • Essential questions • Engineering design process iterations • Program development documentation in engineering notebook • Demonstration of effective teamwork skills • Project rubric 	<ul style="list-style-type: none"> • System physical construction • Number of sensors effectively used • Program flowchart • Program code • Performance of system to complete the objective • Demonstration of effective teamwork skills • Appropriate safety plan • Total cost of the system • Presentation of project • Project report • Project rubric 	3.2.3a.B Pneumatic Part Feeder (FT)	K1, K2, S1, S2, S3, S4
3.2.3b Pneumatic Manipulator (FT)	<ul style="list-style-type: none"> • Essential questions • Engineering design process iterations • Program development 	<ul style="list-style-type: none"> • System physical construction • Number of sensors effectively used • Program flowchart 	3.2.3b Pneumatic Manipulator (FT)	K1, K2, S1, S2, S3, S4

	<p>documentation in engineering notebook</p> <ul style="list-style-type: none"> • Demonstration of effective teamwork skills • Project rubric 	<ul style="list-style-type: none"> • Program code • Performance of system to complete the objective • Demonstration of effective teamwork skills • Appropriate safety plan • Total cost of the system • Presentation of project • Project report • Project rubric
--	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

--	--