ROBOTICS IN MANUFACTURING FUNDAMENTALS (RMF)
SKILLS CHECKLIST

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1.0 Manufacturing Foundations/Awareness

Performance Objective 1.1: Manufacturing Foundations/Awareness: Demonstrate the ability to recognize manufacturing foundation applications and their purpose.

	Performance Indicator	Verification Date/Initial
1.1.1	Apply Knowledge & Analyze units of measure. Convert length measurements within the Metric System. Convert between English and Metric measurements.	
1.1.2	Identify and describe the difference between manufacturing & production methods. • Batch production • Continuous Production • Just-in-time Manufacturing/Lean • Mass production	
1.1.3	Identify a fixed layout and describe the benefits of using a fixed layout.	
1.1.4	Identify and describe manufacturing automation. Identify appropriate personal protective equipment for working with automated systems.	
1.1.5	Identify a fixed automation system.	
1.1.6	Identify a hard automation system.	
1.1.7	Identify a flexible manufacturing system.	
1.1.8	Identify a robot combined layout and describe the advantages.	
1.1.9	Identify a process layout and describe the advantages.	
1.1.10	Apply Knowledge & Analyze Information Introduction to Industry 4.0 & SMART Manufacturing (AI, Data Analytics, IIOT, Cybersecurity, AR/VR).	

2.0 Robot Applications

Performance Objective 2.1: Robot Applications: Demonstrate the ability to recognize robot applications and their purpose.

	Performance Indicator	Verification Date/Initial
2.1.1	Identify and describe the application of robotic welding.	
2.1.2	Identify and describe the application of automated assembly.	
2.1.3	Identify and describe the application of automated material handling.	
2.1.4	Identify and describe the application of robotic inspection.	
2.1.5	Identify and describe the application of automated paint/spray paint.	
2.1.6	Identify and describe the application of robotic palletizing.	
2.1.7	Identify and describe the application of automated sorting.	

3.0 Safety

Performance Objective 3.1: Hazardous Materials: Demonstrate the ability to properly use a Safety Data Sheets (SDS) in the workplace.

	Performance Indicator	Verification Date/Initial
3.1.1	Demonstrate proper selection of SDS sheets.	
3.1.2	Identify and describe first aid measures listed on a SDS sheet.	
3.1.3	Identify and describe hazard identifications listed on a SDS sheet.	
3.1.4	Identify and describe storage and handling listed on a SDS sheet.	
3.1.5	Identify and describe the disposal requirements listed on a SDS sheet.	

Performance Objective 3.2: Bloodborne Pathogens: Demonstrate the techniques that you use to prevent exposures to bloodborne pathogens.

	Performance Indicator	Verification Date/Initial
3.2.1	Identify the closest First Aid Kit.	
3.2.2	Identify the closest Biohazard response kit.	
3.2.3	Simulate the techniques that you use to prevent exposures to bloodborne pathogens.	
3.2.4	Simulate the actions you should take if you suspect you may have been exposed to a bloodborne pathogen.	

Performance Objective 3.3: Fire and Safety: Demonstrate the ability to properly perform fire safety.

	Performance Indicator	Verification Date/Initial
3.3.1	Demonstrate the ability to identify locations of the fire exit, fire hose, and fire extinguisher using a Fire Prevention Plan (FPP) document.	
3.3.2	Demonstrate the ability to identify and eliminate fire hazards.	
3.3.3	Demonstrate or simulate the proper use of a portable fire extinguisher.	

Performance Objective 3.4: Personal Protective Equipment (PPE): Demonstrate the ability to select and use common safety practices required for most manufacturing environments.

	Performance Indicator	Verification Date/Initial
3.4.1	Demonstrate proper selection and use of safety glasses.	
3.4.2	Demonstrate proper selection and use of a clear face shield.	
3.4.3	Demonstrate proper selection and use of safety gloves.	
3.4.4	Demonstrate proper selection and use of ear plugs/muffs.	
3.4.5	Demonstrate proper selection and use of protective footwear.	
3.4.6	Demonstrate the ability to identify hazards in a work area.	
3.4.7	Recognize and identify an emergency stop on a piece of equipment.	
3.4.8	Recognize and identify the different safeguarding systems on a piece of equipment.	
3.4.9	Identify and inspect eye wash stations, hand wash stations, and first aid kits.	

Performance Objective 3.5: Lockout/Tagout: Recognize when lockout/tagout is occurring, and the role of an affected and authorized worker in keeping the procedure safe.

	Performance Indicator	Verification Date/Initial
3.5.1	Locate Lockout/Tagout Log.	
3.5.2	Properly identify different Lockout/Tagout devices and tags.	
3.5.3	Locate Lockout/Tagout devices and tags.	
3.5.4	Demonstrate the ability to properly verify that an electrical, hydraulic, or pneumatic energy source has been isolated.	
3.5.5	Demonstrate the ability to isolate an electrical, hydraulic, or pneumatic energy source has been isolated.	
3.5.6	Demonstrate the ability to properly verify that an electrical, hydraulic, or pneumatic energy source has been placed back in service.	

Performance Objective 3.6: Demonstrate the ability to recognize safety devices and their purpose.

	Performance Indicator	Verification Date/Initial
3.6.1	Demonstrate the ability to locate and identify safety barriers and guards.	
3.6.2	Demonstrate the ability to locate and identify interlocked barrier guards.	
3.6.3	Demonstrate the ability to locate and identify presence sensing devices.	
3.6.4	Demonstrate the ability to locate and identify sensor arms.	
3.6.5	Demonstrate the ability to locate and identify pressure mat.	
3.6.6	Demonstrate the ability to locate and identify alarms.	
3.6.7	Demonstrate the ability to locate and identify e-stops.	
3.6.8	Demonstrate the ability to locate and identify light curtains.	
3.6.9	Demonstrate the ability to locate and identify pinch points.	

4.0 Robot Types

Performance Objective 4.1: In an industrial environment demonstrate the ability to identify various types of robots.

	Performance Indicator	Verification Date/Initial
4.1.1	Visually identify collaborative robots.	
4.1.2	Visually identify mobile autonomous robots.	
4.1.3	Visually identify types of robot movement. Selective Compliance Assembly Robot Arm (SCARA) • Cartesian • Cylindrical • Spherical • 6-Axis • Articulated (or Serial) Robots • Parallel Robot (Delta Robot • Pick & Place Robots	

5.0 Robot Hardware and Software

Performance Objective 5.1: Demonstrate the ability to locate and identify the major components of robots.

	Performance Indicator	Verification Date/Initial
5.1.1	Body	
5.1.2	Joints (Prismatic, Revolute)	
5.1.3	Arms	
5.1.4	Encoder	
5.1.5	End Effectors and end of arm tooling	
5.1.6	Hydraulics	
5.1.7	Pneumatics	
5.1.8	Servo Motors	
5.1.9	Stepper Motors	
5.1.10	Torque, Friction, Force	
5.1.11	Limit Switches	
5.1.12	Vision Sensors	
5.1.13	Proximity Sensors	
5.1.14	Collision Sensors	

6.0 Robot Programming and Operations

Performance Objective 6.1: Demonstrate the ability to locate and identify the major components of robots.

	Performance Indicator	Verification Date/Initial
6.1.1	Demonstrate the ability to read and interpret prints and drawings.	
6.1.2	Identify and describe the Cartesian Coordinate System & Robot Positioning. • Linear Axes 9X, Y, Z Origin • Positive & Negative Direction • Rotational Axes (A, B, C) • Joint Frame • Tool Frame • Tool Center Point • User Frame • Tool Control Point • Control Group & Jogging Coordinate • Relative Position • Degrees of Freedom	
6.1.3	Identify and describe the different coordinate systems. • Cartesian Coordinate System • Cylindrical Coordinate System • Base Coordinate System • Tool Coordinate System	
6.1.4	Identify and describe the components used for different control systems. • Control Loops • Open Loops (Non-Servo) • Process Control (Proportional-Integral-Derivative/PID Control) • X, Y, Z Movements	
6.1.5	Identify different device configurations.	
6.1.6	Identify the different robots by their motion classification. • Manual Movement • Joint Motion • Circular Motion • Linear Motion	
6.1.7	Demonstrate online programming. • Teach Pendant and Walk-Through/Lead-Through Programming • Programming • Right Hand Rule	

Student Signature:	Completed: MM/DD/YY
Verifier Signature:	Completed: MM/DD/YY