## Curriculum Outline – Advanced Manufacturing Institute

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<thead>
<tr>
<th>Curriculum Content</th>
<th>Corresponding Competencies</th>
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| Advanced Manufacturing Industry Introduction: 8 hours | • Define Manufacturing  
• List Manufacturing Sectors  
• Describe the impact of regulations in a manufacturing environment  
• Identify good personal ethical characteristics and behavior  
• Differentiate between good and poor business ethics |
| Participants will explore the modern manufacturing industry; Industry sector/regulations/business economics and the corporate and personal work ethics that are involved | |
| Lean 5S: 4 hours | • Describe the 5S process and how to apply it to maintain a high performance work area  
• Demonstrate the ability to leverage 5S tools to eliminate waste in the workplace lab  
• Identify how 5S principles improve performance and quality |
| Participants learn a process and method for creating and maintaining an organized, clean, high-performance workplace where abnormalities are visible and obvious. The course will take participants through each ‘S’, Sort, Straighten, Shine, Standardize, and Sustain, in a logical approach to improve performance in a manufacturing area. The participants will recognize waste within a manufacturing environment and create countermeasures using 5-S principles to eliminate or reduce the wasteful activity. - Delivered by Employers Association | |
| Applied Math Fundamentals: 14 hours | • Apply basic math functions to solve workplace problems  
• Calculate percentage, rate, ratio, decimal, and proportion with and without the use of a calculator  
• Create and interpret basic graphs and charts used in manufacturing  
• Perform basic arithmetic functions  
• Make reasonable estimates of arithmetic results without the use of a calculator  
• Add, subtract, multiply, and divide four digit numbers without the use of a calculator |
| Participants will be equipped with the basic arithmetic skills to be successful in a production role in a manufacturing environment. Participants will have a basic understanding of problem solving through computations with whole numbers, fractions, decimals, ratios, percents, and the ability to implement the appropriate order of operation. | |
| Basic Mechanical: 8 hours | • Demonstrate basic mechanical skills  
• Identify and report equipment malfunctions  
• Follow established safety procedures when around machinery/equipment  
• Use a systematic team problem solving approach  
• Develop and use a safety checklist  
• Follow cleanliness standards  
• Describe the concept of action/reaction  
• Identify pinch and shear points  
• Identify potential energy sources  
• Describe importance of sprocket and chain alignment  
• Describe safety issues related to chain and sprocket alignment  
• Explain why there is a difference in importance between belt alignment and chain alignment  
• Evaluate mechanical timing issues  
• Determine difference and similarities between mechanical and electronic timing  
• Identify the action/reaction relationships that effect timing  
• Apply critical thinking methodology to timing systems  
• Evaluate components that are worn and interpret the effects on related systems |
| Participants will learn the fundamental principles of safe mechanical work practices, methods of maintaining and troubleshooting mechanical plant equipment and the competencies needed to recognize and report worn part conditions. | |
| Basic Electrical: 8 hours | • Identify and explain basic electrical components and their interactions  
• Demonstrate where the electrical switches and sources are on the manufacturing line, given the proper diagrams for different sources of electricity  
• Identify where the electrical panel is for the manufacturing |
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<th>Description</th>
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<tbody>
<tr>
<td>Industrial Blueprint Reading: 10 hours</td>
<td>Participants will learn drafting and blueprint reading procedures, alphabet of lines, auxiliary views, assembly drawings, title blocks, drawing changes and standard symbols. Emphasis is placed on actual industrial conditions and hands-on applications.</td>
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<tr>
<td>Precision Measurement: 10 hours</td>
<td>Participants will be able to use precision and semi-precision instruments to inspect part dimensions and functional test requirements. Participants will understand the relationship between dimensional metrology and the quality. Participants will be able to demonstrate a working knowledge of basic concepts of dimensional metrology as they apply to terminology, methodology and application of common measuring instruments used for inspection of part dimension and functional test requirements. Participants will be able to perform simple calibration checks and the setting of measuring instruments.</td>
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<tr>
<td>Quality Management: 4 hours</td>
<td>Participants will recognize the Quality Management Systems available to organizations to ensure the organization consistently meets or exceeds customer expectations. The course focuses on process measurement and controls as means of continuous improvement.</td>
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<tr>
<td>Statistical Process Control: 10 hours</td>
<td>Participants will learn the principles and application of statistical process control tools as commonly used on the shop floor. Participants will determine when SPC is appropriate, what type of SPC tool should be used in a particular situation, and how to monitor the process and interpret the results. Simple problem solving and data analysis techniques will also be applied.</td>
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<tr>
<td>Introduction to Programmable Logic Controls: 4 hours</td>
<td>Participants will learn what a PLC is, observe it’s operation, describe how a PLC functions, identify, define key PLC terminology.</td>
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- Identify basic electrical components and their interaction in a circuit
- Recognize different over currents, such as short circuits, ground faults and overloads
- Utilize troubleshooting guidelines to identify which components of the manufacturing line will cause a power outage and what to do in case of a power outage
- Use Safety guidelines to follow the safety rules and regulations surrounding the electrical components of the manufacturing line
- Describe techniques to help prevent failures of electrical components
- Effectively communicate line malfunction issues with an Electrician

- Define basic blueprint terminology
- Identify different types of dimensions
- Identify general note symbols
- Interpret commonly used abbreviations and terminology
- Determine tolerances associated with dimensions on a drawing
- Identify types of lines with a drawing
- List the essential components found in the title block
- Identify orthographic views
- Identify positions of views; top, front, side, auxiliary, section
- Determine the scale of the view or section
- Check for revisions

- Select and use appropriate measurement techniques and instruments
- Describe measurements’ role in manufacturing
- Distinguish between direct and calculated measurements
- Illustrate measurement differences when taken with calibrated and non-calibrated instruments
- Match appropriate measurements tools with various tool usage
- Demonstrate proper measurement tool usage
- Convert between US and metric measurement systems
- Interpret results of measurements and calculations
- Distinguish between general and precision measurement
- Distinguish between US and metric measurement systems

- Define SPC
- Identify the relationship between SPC steps and specific production processes
- Analyze production specific processes
- Collect, analyze and interpret process test data for compliance to specifications
- Improve production process (if indicated by analysis of data)
- Demonstrate the ability to apply SPC techniques in the workplace

- Describe how a PLC functions
- Identify, define key PLC terminology
usage, applications, hardware selection, configuration and be introduced to programming examples and troubleshooting techniques.

- Describe different types of signals that go into a PLC
- Describe how to troubleshoot a simple control system that uses a PLC
- Identify how to prevent common, simple PLC and instrumentation failures

Basic Industrial Fluid Power: 4 hours

Participants will study basic fluid power laws and principles, force, work and power as related to fluid power, the differences/similarities between pneumatic, hydraulic and vacuum systems.

- Identify the purpose and advantages of a fluid power system
- Identify the compressibility/no-compressibility of gases and liquids
- Read and report pressure and vacuum gauge scaling in psig, bars, in Hg and MM Hg
- Determine the best operating range for gauges
- Identify the construction type and explain the operating principles of various types of directional control valves
- Demonstrate the application of force, work and power as applied to fluid power
- Evaluate and report pressure gauge conditions in a fluid power system under operation conditions; fluid flow at various loads and under dead head conditions
- Identify the conditions necessary to develop pressure in a column of fluid
- Identify the conditions necessary to develop a vacuum in a fluid power system
- Diagnose problems with fluid power systems and recommend preventative or corrective actions

Root Cause Analysis/Problem Solving: 6 hours

Participants will practice analytical problem-solving thinking and develop skills to apply the structured 8-D Corrective Action approach at the individual and team level.

- Discuss the use of problem solving tools (e.g. Fishbone diagrams, why-why analysis, IS/IS-NOT)
- Identify the benefits of the team approach to problem solving
- Determine the usefulness of statistical tools for investigation and corrective action verification

Team Member and Team Workgroup Participation: 6 hours

Participants will learn the importance of working together as a team to accomplish the goals of their organization. Participants will also be equipped with an understanding of the traits of successful teams and tools that foster teamwork and communication.

- Interactive situations
- How to disagree with your boss tactfully
- Go over work expectations including punctuality, attendance, dress, work ethic, attitude, etc
- Identify different types of work teams
- Describe the traits of successful teams
- Describe the role of an individual on a team
- Define the role of a team leader
- Identify the stages of team development
- Describe how to address concerns and conflict in a team environment

Total Estimated Program hours: 96

(Optional after class) Job Applicant Communications: 2 hours

Participants will apply effective resume writing and interviewing techniques in preparation for a Manufacturing Entry level position.

- Develop personal professional resumes that effectively communicate skills, education and experience that support success in the advanced manufacturing environment
- Demonstrate effective interview communication skills to enable the participant to articulate their knowledge, skill and experience as they relate to the advanced manufacturing environment

***Safety courses can be taken as an elective