Manufacturing and Automation Program

Program Length:

900 Total Hours
133 Lecture Hours
567 Shop Hours
200 Externship Hours

Program Description – Industrial Electrician Technician Training through Manufacturing and Automation Program

This twenty-six (26)-week, 900-hour program is hands-on, designed to train students in electronics and electronic troubleshooting, manufacturing technologies, industrial automation and process controls, resume writing and interviewing. Using a hands-on curriculum, students learn how to use and operate electronics modules, internet computers, energy controls and monitoring systems, oscilloscopes, multi-meters, robotic work cells, packaging equipment and more. The program also utilizes programmable logic controllers, robotics & robotic controllers, machine vision systems, controls & electrical panels, energy controls, and automatic sequencing machines.

Manufacturing and Automation Diploma Program

Course/Number Lesson	Title	Clock Hours Lecture	Clock Hours Shop	Total Clock Hours
MAT001	History of Manufacturing & Automation	3	11	14
MAT002	Workplace Math & Basic Electronics	8	38	46
MAT003	Safety of Electrical/Mechanical Systems	3	29	32
MAT004	Equipment & Design	3	21	24
MAT005	Equipment Design Criteria, Specification	8	24	32
MAT006	Introduction to PLCs & Electrical Diagnostic Equipment	5	11	16
MAT007	PLC Programming	24	56	80
MAT008	Hydraulic/Pneumatics, Actuators, PLC, Hardware & Sensors	5	27	32
MAT009	Robotics & PLC Interfaces	8	56	64
MAT010	Electrical Machine Interfaces of Hydraulic & Pneumatic Systems	5	19	24
MAT011	Equipment Maintenance/PLC	4	20	24
MAT012	Process Equipment Diagnosis	4	20	24
MAT013	Process Monitoring & Correction	2	22	24
MAT014	Computer Aided Design	2	30	32
MAT015	Controls & Instrumentation	5	15	20
MAT016	Packaging & Seals	2	22	24
MAT017	Manufacturing Assembly Operations	2	22	24
MAT018	Fluid/Energy Operations	2	30	32
MAT019	Medical Manufacturing Processes	5	35	40
MAT020	ISO 9000 & 14001	5	19	24
MAT021	Documentation & Document Control	5	19	24
MAT022	Process & Product Validations	3	13	16
MAT023	Resume Writing	10	2	12
MAT024	Interviewing Skills, Teamwork & Management Communications	10	6	16

MAT025	Externship	0	200	200
	TOTALS	133	567	900

Certification:

A diploma of completion will be given to each student upon completing the course. This diploma will be used to show a perspective employer evidence of program completion and the skills attained for successful work in the manufacturing and automation industry.

OSHA 30:

Classes will be provided to students in this program at no cost. Certification will be granted and issued at completion of the program.

Course Descriptions – Manufacturing & Automation

MAT001 - History of Manufacturing & Automation

The student will learn about the history of manufacturing and automation (M & A), the necessity to make high quality products for consumers and the professional markets. Through theory and application, the focus of this course will be to learn about how manufacturing and automation maintenance technicians play a vital role in the workplace to keep high speed production machines well maintained. to prevent quality concerns and zero recalls for all products and services.

MAT002 - Workplace Math & Basic Electronics

Participants will take a workplace math primer for using tools, using formulas, make and read simple drawings, estimate weight and working qualities, calculate slopes, and do data analysis related to electrical properties in volts, ohms, current, capacitance, transformers, diodes, transistors, as well as temperature-pressure-speed-acceleration sensors. Students will utilize spreadsheets, perform analysis of various systems, and understand critical process data.
Prerequisite: MAT001

MAT003 - Safety of Electrical/Mechanical Systems

This course will teach the student about high-speed mechanical and electrical design related to manufacturing, assembly operation, and process control. This course will teach students the about theory of torque, force, speed, pressure, and temperature as it relates to part handling, metal forming, fluid processing, fabricating, inspection/testing, marking, packaging, and chemicals.
Prerequisite: MAT001, MAT002

MAT004 - Equipment & Design

Students will be taught the original equipment design criteria and specification for manufacturing machinery. Students will learn to read blueprints, understand cycle-time, design parameters, quality metrics, human interface, machine guards, rotating machine alignment requirements, preventative maintenance, input/output sensors, and control interfaces.
Prerequisite: MAT001, MAT002, MAT003

MAT005 – Equipment Design Criteria/Specification

Students will be taught what are the original equipment design criteria and specification for manufacturing machinery. Students will learn to read blueprints, understand cycle-time, design parameters, quality metrics, human interface, machine guards, rotating machine alignment requirements, quick changeovers, preventative maintenance, input/output sensors, and control interfaces.
Prerequisite: MAT001, MAT002, MAT003, MAT004

MAT006 - Introduction to PLCs & Electrical Diagnostic Equipment

Students will acquire a working knowledge of Programmable Logic Controllers (PLCs) to perform entry level work as a Manufacturing & Automation Technician such that they can secure employment in a manufacturing and/or automation company to maintain, repair, trouble-shoot, and install equipment in a product and/or service manufacturing plant operation.
Prerequisite: MAT001, MAT002, MAT003, MAT004, MAT005

MAT007 - PLC Programming

Students will acquire a working knowledge of PLC Programming to perform entry level work as a Manufacturing & Automation Technician such that they can secure employment in a manufacturing and/or automation company to maintain, repair, trouble-shoot, and install equipment in a product and/or service manufacturing plant operation.
Prerequisite: MAT001, MAT002, MAT003, MAT004, MAT005, MAT006

MAT008 - Hardware & Sensors

Students will learn about more advanced alternating current, electrically actuated hydraulic and pneumatic actuators such as pistons, rotary motors, spool valves, pop-it valves, pressure valves, compressors, incandescent water treatment systems, strainers and other systems used in manufacturing operations. The actuators will then be used in various logical configurations within PLC systems. Student will learn how actuators function in manufacturing operations and/or manufacturing field operations with common digital field input devices include pushbuttons, limit switches, photo sensor and common digital output devices include relays, motor starters, and solenoid valves. This course will focus on using PLCs to trouble-shoot electrical wiring and/or PLC hardware problems and take corrective action to repair equipment.
Prerequisite: MAT001, MAT002, MAT003, MAT004, MAT005, MAT006, MAT007

MAT009 – Robotics & PLCs

In this course, students will learn how to interface flexible automation devices such as such as robotics and PLCs so that "hand-shaking" can occur through programs and using contacts, coils, cascading timers, delays, cascading timers, latches, single shot pulse, starting and stopping a process control, how to use PLC Instructions in your programs using binary and hex. Emphasis will be placed on mechatronics and trouble- shooting inter-relationships of PLC and robotic systems for maintainability.
Prerequisite: MAT001, MAT002, MAT003, MAT007, MAT008

MAT010 – Hydraulic & Pneumatic Systems & their Electrical Machine Interfaces

Students will learn about more advanced knowledge of electrically actuated hydraulic and pneumatic actuators such as pistons, rotary motors, spool valves, pop-it valves, pressure valves, compressors, incandescent water treatment systems, strainers and other systems used in manufacturing operations. This course will focus on sing PLCs to trouble-shoot electrical wiring and/or PLC hardware problems and take corrective action to repair equipment. Student will write programs to tune-on and off hydraulic pumps, run linear pistons, turn off and on pumps hydraulically.
Prerequisite: MAT001, MAT002, MAT003, MAT004, MAT005, MAT006, MAT007, MAT008

MAT011 - Equipment Maintenance/PLC

Students will learn how to handle hand-tools to accomplish scheduled maintenance. Hand-tools such as wretches, air tools, pullers, machinist rulers, Allen keys, hammers, screw drivers, pliers, grips, breaker bars, saws, grinders, rotational shaft alignment, hand wrenches, lubrication equipment, and calibration equipment. The course is designed to teach theory and hands-on use of hand-tools to maintain manufacturing equipment.
Prerequisite: MAT001, MAT002, MAT003, MAT004, MAT005, MAT006, MAT007, MAT008, MAT009, MAT010

MAT012 - Process Equipment Diagnosis

This course is designed to teach students about diagnosis theory, looking for faults, finding shorted components or wiring, open circuitry, sub-component failures to ancillary systems, PLC faults and component failures, intermittent actuator breakdowns, and mechanical failure that appear to be electrical faults, bearing failures, and mechatronic systems, integrated technology, and automation. This course will stress technical competency within the context of troubleshooting and technical problem-solving related to mechatronic systems.

Prerequisite: MAT001, MAT002, MAT003, MAT004, MAT005, MAT006, MAT007, MAT008, MAT009, MAT010, MAT011

MAT013 – Process Monitoring & Correction

In this course, students will be introduced to statistical process control (SPC) and shall develop control charts, quality control histograms and understand how this plays a vital role in maintenance and repair of manufacturing machinery. Students will be taught about process variability, control limits, common-cause and special-cause variation, determining when a process is in control and out of statistical process control. This course will teach the student how to relate maintenance and mechatronics to process monitoring and correction.

Prerequisite: MAT001, MAT002, MAT003, MAT004, MAT005, MAT006, MAT007, MAT008, MAT009, MAT010, MAT011, MAT012

MAT014 – Computer Aided Design

Students will learn how to mark drawing layout utilizing AutoCAD software. Students will learn how to identify layers of AutoCAD drawings, drawing lines, trim a line, draw a circle, extend a line, drawing a rectangular polyline, working with a rotated background, creating a fillet, drawing a rectangle, pan and zoom, write text, and set dimensions. Emphasis in this course will be for students to communicate with engineers and other technicians in manufacturing.

Prerequisite: MAT001, MAT002, MAT003, MAT004, MAT005, MAT006, MAT007, MAT008, MAT009, MAT010, MAT011, MAT012, MAT013

MAT015 – Controls & Instrumentation

In this course, students will be taught how different control systems communicate with instrumentation. Students will setup, configure, and tune various real-world instrumentation and controls for speed, acceleration and start/stop sequencing of training stations. Strong emphasis is placed on understanding industrial instrumentation in their manufacturing and their processes.

Prerequisite: MAT001, MAT002, MAT003, MAT004, MAT005, MAT006, MAT007, MAT008, MAT009, MAT010, MAT011, MAT012, MAT013, MAT014

MAT016 – Packaging & Seals

Students will be taught about packaging & seals, types of materials used in packaging, operations complete with motor controllers, conveyor belts, photo sensors, wiring diagrams, maintenance specifications, trouble-shooting problems for root cause and corrective actions with actuators, pistons, and rotary index boxes.

Prerequisite: MAT001, MAT002, MAT003, MAT004, MAT005, MAT006, MAT007, MAT008, MAT009, MAT010, MAT011, MAT012, MAT013, MAT014, MAT015

MAT017 – Manufacturing Assembly Operations

This course will teach the students about the basics of assembly operations such as robotics, tooling, robotic grippers, setting up automatic welding operations, synchronizing robots to conveyor belt system using PLCs, and close tolerance assembly operations. Students will learn about manufacturing assembly blueprints, operations related to scheduled maintenance, and recommendations of additional maintenance prevent equipment breakdowns.

Prerequisite: MAT001, MAT002, MAT003, MAT004, MAT005, MAT006, MAT007, MAT008, MAT009, MAT010, MAT011, MAT012, MAT013, MAT014, MAT015, MAT016

MAT018 – Fluid/Energy Operations

This course is geared to 1) steam generation and 2) Heating Ventilation and Air Conditioning (HVAC) operations and controls. Students will learn the process cycles of both steam and HVAC systems and how their corresponding mechanical computerized control, motors, valves, relays, pumps, and other ancillary systems. The student will understand how preventative maintenance is accomplished through theory and hands-on practice.

Prerequisite: MAT001, MAT002, MAT003, MAT004, MAT005, MAT006, MAT007, MAT008, MAT009, MAT010, MAT011, MAT012, MAT013, MAT014, MAT015, MAT016, MAT017

MAT019 – Medical Manufacturing Processes

This course will teach students about medical devise manufacturing and the stringent requirements of equipment and processes needed for production readiness. This course includes Good Manufacturing Practices (GMP) by the Food & Drug Association (FDA). Students will learn about the organization and personnel, buildings and facilities, equipment, control of components and drug product containers and closures, production and process controls, packaging and labeling control, and records and reports. The purpose of this training is to allow students to understand the impact on their careers of maintenance technicians in manufacturing.

Prerequisite: MAT001, MAT002, MAT003, MAT004, MAT005, MAT006, MAT007, MAT008, MAT009, MAT010, MAT011, MAT012, MAT013, MAT014, MAT015, MAT016, MAT017, MAT018

MAT020 – ISO 9000 & 14001

This coursework will give the student an in-depth understanding of the International Organization of Standardizations (ISO). Students will learn ISO 9001. In the ISO 9001 standards, students will learn definitions to the international standards, how to apply ISO to maintenance standards, authority, and audits, managing change to processes overtime.

Prerequisite: MAT001, MAT002, MAT003, MAT004, MAT005, MAT006, MAT007, MAT008, MAT009, MAT010, MAT011, MAT012, MAT013, MAT014, MAT015, MAT016, MAT017, MAT018, MAT019

MAT021 – Documentation & Document Control

This coursework will educate the student on how to properly document maintenance work relative to their responsibilities and, when the need arises, diagnosis and repair as well as change orders for equipment. Emphasis will be placed on standard understanding of automated scheduling and documentation of maintenance requirements, and work orders. Students will learn how document control software systems work and how this streamlines the vital processes, saves valuable time, and keeps operations in compliance to FDA and ISO requirements.

Prerequisite: MAT001, MAT002, MAT003 MAT004, MAT005, MAT006, MAT007, MAT008, MAT009, MAT010, MAT011, MAT012, MAT013, MAT014, MAT015, MAT016, MAT017, MAT018, MAT019, MAT020

MAT022 – Process & Product Validations

The purpose of this course is to introduce the fundamentals of process and product validations, explaining why, how, when, and where these validations are accomplished. Students will learn the necessity of these validations in manufacturing and maintenance of equipment. Students will be involved with equipment installation, setup, and process and product validations. Students will run process and product validations themselves and determine the outcome toward pre-determined specifications.

Prerequisite: MAT001, MAT002, MAT003, MAT004, MAT005, MAT006, MAT007, MAT008, MAT009, MAT010, MAT011, MAT012, MAT013, MAT014, MAT015, MAT016, MAT017, MAT018, MAT019, MAT020, MAT021

MAT023 – Resume Writing, Interviewing Skills

Students will be taught the proper format to place skill-based content into their resumes. Resume writing

will focus on content with abilities and strengths that students have and what employers seek. The skills section of the resume will reflect the soft and technical skills before and after the student graduated from PTTI. Each student will be taught how to undergo successful interviews and will participate in group as well as individual interview training sessions that simulate business communication and question/answer sessions. Students will complete skill and work-related questionnaires, interview with PTTI job developers, and finally develop resume while corresponding PTT's job developer and the staff. Resumes will be stored on PTTI's secure web-portal for updates and future job opportunities as a continued service for the student.

Prerequisite: MAT001, MAT002, MAT003, MAT004, MAT005, MAT006, MAT007, MAT008, MAT009, MAT010, MAT011, MAT012, MAT013, MAT014, MAT015, MAT016, MAT017, MAT018, MAT019, MAT020, MAT021, MAT022

MAT024 – Management Communications & Teamwork

Students will acquire a working knowledge of management communications and teamwork to enable them to secure employment in an entry-level position as a Manufacturing & Automation Technician. This course will aid student to, upon program completion, be employed at a manufacturing and/or automation company to maintain, repair, troubleshooting, or install equipment in a product and/or service manufacturing plant operation. This course is designed with both lecture and interactive learning, along with shop demonstrations, question/answer sessions, and right and wrong customer service communications. Emphasis will be placed on securing employment, problem-solving skills, professional customer service, and employment literacy.

Prerequisite: MAT001, MAT002, MAT003, MAT004, MAT005, MAT006, MAT007, MAT008, MAT009, MAT010, MAT011, MAT012, MAT013, MAT014, MAT015, MAT016, MAT017, MAT018, MAT019, MAT020, MAT021, MAT022, MAT023

MAT025 – Internship

Every student will go into an internship that is designed to provide a mix of additional manufacturing equipment maintenance, troubleshooting and repair experience. The internship is designed to help the future professional to master the skills of a manufacturing and automation technician. Each student will complete manufacturing technician job assignments from routine maintenance to more complex assignments while working side-by-side other manufacturing technician or engineers during their training. During the internship, students will advance their maintenance skills, perform diagnoses and make repairs to various components and systems in which they were educated and trained. The purpose of the internships is to have student hired into the job after the internship term is completed. Finally, the student intern will complete a report and evaluate the internship for permanent employment with the internship company. In addition, the internship company will be required to complete an evaluation for the student that will help the student progress with their initial and continued employment.

Prerequisite: All courses from MAT001 through MAT024