Program Description

MECHATRONIC SYSTEMS TECHNICIAN ACADEMY

Kalamazoo VALLEY community college
A Mechatronic Systems Technician is able to perform the work of installing, maintaining and troubleshooting mechanical and electrical equipment that is controlled by electronic and computer driven components. Key to understanding the term Mechatronic is the word “system”. The functionality of everyday products from automobiles to heating and air conditioning equipment to manufacturing lines requires programmed control systems to operate. Each of these examples include common components (i.e. motors and gears) which work together based on programmed logic.

The Mechatronic Systems Technician Academy provides the skills and knowledge to work on a wide range of industrial electrical and mechanical systems that are controlled by electronics and computers, such as robots, packaging, advanced manufacturing lines and other equipment.

The Mechatronic Systems Technician Academy provides the hands-on, practical opportunities to learn about automated manufacturing processes and the systems that modern manufacturing companies rely on.

Companies today require well-rounded technicians with the technical skills and problem solving abilities to set up, maintain, troubleshoot and repair the complex mechatronic systems. Modules of study in this academy include Fundamentals of Electricity, Mechanical Systems, Integrated Information Technologies and Automated Control Systems. These modules are taught in context of their relationships to one another, with a strong emphasis on diagnosis of faults and troubleshooting.

The Mechatronic Systems Technician Academy is a 20-week, full time, competency-based training program. Those selected will participate in structured classroom learning and hands-on practical application of skills in the learning lab. The program is guided by employers who support student learning through facilitation of tours and through field work experience.
Mechatronic Technician
Under general direction of Maintenance Manager, provides technical support to the production floor to ensure all equipment associated with production and facility are running properly. This includes but is not limited to packaging lines and automation cells. Participation in continuous improvement processes, general upgrading of equipment and maintenance of equipment and documentation is required. Diagnose mechanical and electrical problems in all systems and make proper repairs. Have the ability to program equipment and robotics. Work independently and as a member of a team to support production floor. Projects range from simple program modifications to major rebuilds and modifications with mechanical, pneumatic and electrical work.

JOB REQUIREMENTS:
1. Technical Training, Associate’s degree in a technical discipline, and/or a significant amount of related work experience.
2. Demonstrated ability to troubleshoot, update, and work on all equipment and products in designated area of responsibility. Must have current knowledge of electronics and be able to apply it to the job. Strong emphasis is placed on analysis and debugging of products and equipment.
3. CAD skills as required to update, read, and understand test systems and products. Computer skills including use of Microsoft Excel, Access, and Word.
4. Demonstrated good interpersonal and written/verbal communication skills to communicate with internal and external customer and work in a team environment. Must be able to lead, train, and support other staff.
5. Documentation of all work performed to include but not be limited to Daily Logs, Shift Reports, PM’s, and Work Orders through Microsoft Office
6. Must be able to read electrical and mechanical schematics.

Field Service Technician
Persons with a strong mechanical, electronic and/or technical background in industrial environments would be great candidates. Will train qualified candidate in-house and in the field. Strong troubleshooting and problem solving skills are a must. Once trained, candidate will be expected to work with others and be a team player, but will mostly perform duties unsupervised. Basic computer skills are also desired and are increasingly important. Must have strong interpersonal and customer service skills. Must be in good physical condition and be able to lift at least 100 lbs. Must be willing to work some overtime and weekend hours, may also include some overnight travel. Above all, we are seeking applicants who are performance driven and strive to be the best.

JOB REQUIREMENTS:
1. Must have a valid Driver’s License. A Class B CDL is preferred.
2. Having a 2-year degree or certificate from vocational trade school in Electronics, Mechatronic, or Industrial Maintenance fields is a definite plus.
3. Must be able to pass a Criminal Background Check and a Drug Test prior to employment.

Test and Verification Setup, Operation, and Documentation
Operates and tests instrumentation to verify hardware and software. Test and verification areas include: runs test protocols and document tests based on engineering requirements, performs and documents validation work on instruments based on engineering requirements, and provides sound recommendations for improvements. Documentation control areas include: Assisting with proper design documentation, including Corrective Action Reports (CAR) and Engineering Change Order (ECO) reports, assisting with proper test and validation documentation, and maintaining an engineering notebook.
The program was developed to meet local, regional and national need for technicians who have demonstrated proficiency to perform various work assignments on a Mechatronic system. Graduates will be prepared to perform work in the industrial sector including maintenance, troubleshooting, and repair on equipment in positions such as industrial maintenance technician, automated manufacturing technician, engineering technician, and field service technician. The combination of skills gained through this training is highly transferable to technician jobs in many industry sectors.
Manufacturing and industrial sector employers require highly skilled technicians. Within their area of specialty (i.e., robotics, instrumentation, or automated packaging lines) a Mechatronic Systems Technician will be required to participate in lean manufacturing initiatives, contribute to quality control efforts and work effectively as a member of a team. Employees must demonstrate a commitment to safety, an understanding of the balance between productivity and maintenance requirements, and the need to meet customer expectations. Employers expect strong personal ethical characteristics and behaviors and a commitment to success.

Candidates must also be willing to work a variety of hours including holidays and weekends. They must be willing to work overtime. Technicians must also be able to keep up with the physical demands such as extended time standing, bending and stooping, lifting, and exposure to noise.
Admission to the program

The Mechatronic Systems Technician Academy accepts students into the program using a screening process which aligns with the requirements of employers and the pre-requisite knowledge and skills needed for success in the program.

Applicants must have demonstrated aptitude for hands-on work. Aptitude is demonstrated through mechanical and/or electrical work experience or other experiences that can verify aptitude. Candidates must demonstrate the ability to apply specific mathematical concepts which are generally associated with first year high school algebra.

The selection process has been designed to allow applicants to make an informed decision about Mechatronic as a career choice, while the instructional team evaluates the candidate’s readiness to be successful in the training.

Applicants must meet each requirement below:

- Have a high school diploma or GED.
- Provide references who can verify experience working in a mechanical and/or electrical field.
- No violent felonies. Violent felony convictions severely hinder the likelihood of being hired. Criminal background checks are performed.
- Algebra skills generally acquired in high school are necessary for success in the academy. Math testing is required.
- Strong personal ethics and professionalism. A workplace industry fit assessment is required.
- Be self-directed and able to focus on an intensive, full-time learning experience.
MECHATRONIC SYSTEMS
TECHNICIAN ACADEMY

PROGRAM CONTENT

ELECTRICAL FUNDAMENTALS
AND ADVANCED ELECTRICAL
CONCEPTS
150 Hours

All students must demonstrate their mastery of electrical and electronic principles, including working safely with electricity, fundamental principles of circuits, diagrams, technical documentation, along with basic functions and properties of electrical components. After mastering the basics, students proceed into more advanced electrical and industrial control system topics, such as digital control circuitry and industrial control strategy.

They will demonstrate their competency by performing tasks such as the safe use of a megger and digital multimeter, reading IEC and NEMA schematics, concept to wiring of motor control circuits and multichannel safety circuits, programming a PLC, setup and operation of an industrial robot and machining center, identifying and describing the form and function of process variables involved with product handling, camera imaging, proximity, position, machine and process control. Students will further demonstrate their competency on mechatronic systems, such as troubleshooting machine control and process control schemes, process variable analysis, robotics, and factory information processing.

AUTOMATION AND
COMPUTERIZED CONTROL
SYSTEMS
260 Hours

This module provides training in the practical applications of machine sensors, pneumatics, encoders and resolvers, motion controls, drives and actuators, machine control configurations, HMI integration with communication protocols, electrical actuators and process control systems for machine and process control. Areas studied include process instrumentation, calibration, configuring and programming PLCs and HMIs over Ethernet, and operation concepts, piping instrumentation diagrams, logic control loops, maintenance logs, equipment drawings, and electrical schematics.

Students demonstrate their competency of machine control by demonstrating how to select, size, program and configure a servo motor, including HMI integration using Ethernet communication protocols. They will also demonstrate how to troubleshoot machine faults using FMEA/FMECA pertaining to manufacturing systems and also learn various predictive and preventative maintenance measures. Students will develop skills surrounding automation and controls of various types including, but not limited to, motor drives, actuators, servo and stepper motors, encoders, resolvers, PLC, I/O, SCADA, robotics, and inspection systems.
Students demonstrate their competency of process control by applying process instrumentation and calibration using a loop calibrator. They will be able to demonstrate process control programming and how to configure and program a PLC and HMI to operate over Ethernet, configure point I/O modules, configure and set up Ethernet communication devices, configure and program process control loops using four basic process variables, while configuring for process optimization.

They will also demonstrate how to start up equipment and manufacturing systems and complete maintenance logs.

**MECHANICAL SYSTEMS**

180 Hours

The units in this module are designed to cover the important mechanical areas found in mechatronic systems, including hydraulics, fasteners, rotating equipment and industrial trades, and crane and rigging. Students must have a working knowledge of gears, bearings, seals, shafts, fasteners, piping, torque tools, and couplers as a basis for developing the skills needed to maintain, repair and troubleshoot.

**Hydraulics**

Students will learn the underlying physics principles of hydraulics, engineering prints and schematic symbols. Students will demonstrate how to interpret engineering prints, change hydraulic fluid and filters, perform leak inspections, and diagnose and correct common hydraulic system faults.

**Fasteners**

In this section, students gain hands-on experience with fasteners used in industry for the assembly and disassembly of components, including common types of threaded and non-threaded fasteners used to join components of parts or pipes. They will learn the theory and importance of proper torque. Students will demonstrate the selection of the proper fastener for the application, and how to use common torque tools.

**Crane and Rigging**

In this section students will learn how to safely move equipment. They will learn how to disconnect the energy source from equipment prior to its removal. They will learn how to inspect rigging gear, communicate with hand signals, use proper rigging, hoisting and moving practices, and work with vertical or horizontal rigging systems. Students will demonstrate how to inspect safety and rigging equipment, as well as plan and execute a lift.
MECHATRONIC SYSTEMS TECHNICIAN ACADEMY

PROGRAM CONTENT

Rotating Equipment and Industrial Trades
This module addresses concepts relating to industrial machine troubleshooting, maintenance and repair, including the importance of following systematic preventive maintenance schedules. In this section, students will learn about lubrication, metrology, bearings, couplers, gearboxes, and principles of pneumatic and vacuum systems. Students also gain exposure to MIG, TIG, and stick welding. Students will demonstrate a bearing and coupler replacement, and perform shaft alignments using various techniques. They will demonstrate how to perform a gearbox inspection using mirrors, borescope and gear marking. They will demonstrate oil sampling and filter changes, backlash measurements, metrology, and how to troubleshoot pneumatic and vacuum systems.

BUSINESS PRINCIPLES
80 Hours
In this module, concepts and skills related to working for a manufacturing company or on industrial equipment are explored, including working with PCs, classes of company software types such as ERP, DCS, HMI, and Microsoft products. Students also learn about employability skills, team-working, leadership and problem solving strategies. Quality control and lean manufacturing concepts of 5S, equipment poka-yoke and value stream mapping will be covered.

Specific learning activities and lab assignments will require students to demonstrate mastery of basic computer skills using MS Word and MS Excel in order to complete maintenance reports and logs, as well as communicate information through email. Leadership, employability and team working skills will be evaluated in specific exercises and through evaluation throughout the program.

SAFETY TRAINING
50 Hours
Classroom instruction, demonstration and laboratory practice assures students have the knowledge, skills and equipment to work safely in and around machinery in an industrial environment. Mastering safety competencies are fundamental to all other modules.

Students will earn these certifications: First Aid, CPR and the use of AED, Forklift Operators and OSHA 10 hour for General Industry. Complete training in the areas of fire safety and fire extinguisher use and maintenance, arc flash, lock out tag out (LOTO), personal protective equipment (PPE), and craning and rigging, are taught and practiced.