UTAH SYSTEM OF HIGHER EDUCATION

Utah System of Higher Education
Automation Technology
FY2027 / 21 Credits (630 Clock-Hours)

Foundational Courses

TEAM 1010 Essential Skills and Safety — 3 Credits / 90 Clock-Hours

The Essential Skills and Safety course teaches the basic concepts and terminology used in automation technology. Students gain proficiency through applying concepts of fasteners, measurement equipment, tolerances, and hand and power tool operations. The course covers safety and workplace skills as well as school and shop specific operations, standards, and procedures.

Objectives:
- Demonstrate a working knowledge of general safety practices and procedures.
- Demonstrate a working knowledge of hand, power, and measurement tools.
- Demonstrate a working knowledge of hardware and fasteners.
- Apply working knowledge of workplace skills.
- Review school specific orientation, standards, and procedures.

TEAM 1020 Pneumatics — 2 Credits / 60 Clock-Hours

The Pneumatics course prepares students with the fundamentals needed to work with pneumatic systems. Pneumatic systems are used in a variety of industries where cleaner, faster, and more cost-effective work needs to be done. Competencies include safety, maintenance, operation, installation, component identification, principles of pressure and flow, air logic, troubleshooting, analysis of performance and efficiency, and design of pneumatic systems.

Objectives:
- Demonstrate a working knowledge of safety practices and procedures of pneumatic systems.
- Operate, install, and maintain pneumatics systems, tools, and devices.
- Read, utilize, and design pneumatic systems schematics.
- Analyze applications and design of pneumatic systems.
- Apply systems diagnostics and troubleshooting of pneumatic circuits.

TEAM 1030 Hydraulics — 2 Credits / 60 Clock-Hours

The Hydraulics course prepares students with the fundamentals needed to work with hydraulic systems. Hydraulic systems are used in a variety of industries where extra force may be required. Competencies include safety, maintenance, operation, installation, component identification, displacement principles, troubleshooting, analysis of performance and efficiency, and design of hydraulic systems.

Objectives:
- Demonstrate a working knowledge of safety practices and procedures of hydraulic systems.
- Operate, install, maintain hydraulic systems, tools, and devices.
- Read, utilize, and design hydraulic system schematics.
- Analyze applications and design of hydraulic systems.
- Apply systems diagnostics and troubleshooting of hydraulic circuits.

TEAM 1040 Industrial Mechanics **3 Credits / 90 Clock-Hours**

The Industrial Mechanics course is designed to introduce students to the world of mechanical drive systems and their characteristics. Students can demonstrate competency in the following: couplers, component identification, system related calculations, alignment, the effects of wear and vibration, component failure detection and prevention.

Objectives:
• Demonstrate a working knowledge of safety practices and procedures.
• Maintain, calibrate, and repair power transmission systems.
• Maintain, calibrate, analyze, and repair mechanical drives (v-belt, chain, gear drive).
• Use and apply vibration and alignment measurement instrumentation and techniques.
• Troubleshoot mechanical drive components and systems.

TEAM 1050 Electrical Systems **2 Credits / 60 Clock-Hours**

The Electrical Systems course teaches students to troubleshoot most electrical circuits they encounter in everyday life. Our world runs on electrical power and is fundamental to all work being done in automation. Students in this course gain relevant working knowledge in both AC & DC electrical systems. Competencies include basic electrical circuit design, analysis, troubleshooting, instrumentation, schematic and component identification, physics of electricity and applicable math.

Objectives:
• Demonstrate a working knowledge of safety practices and procedures of basic electrical systems.
• Operate, install, maintain electrical systems, tools, and devices.
• Read, utilize, and design electrical systems schematics.
• Apply principles and applications of electrical AC and DC systems.
• Apply systems diagnostics and troubleshooting of electrical circuits.

TEAM 1060 Motor Controls **3 Credits / 90 Clock-Hours**

The Motor Controls course prepares students with a working knowledge and understanding of real-world motor control operations. Students who complete this course are able to proficiently setup and design motor control circuits utilizing schematics. Students in this course identify components and utilize instrumentation to troubleshoot and maintain systems.

Objectives:
• Demonstrate a working knowledge of safety practices and procedures.
• Operate, install, maintain, and design motor control circuits.
• Demonstrate a working knowledge of commonly used components, devices, and tools.
• Demonstrate a working knowledge of various control systems.
• Apply systems diagnostics and troubleshooting of motor control circuits.

TEAM 1070 Programmable Logic Controllers **4 Credits / 120 Clock-Hours**

The Programmable Logic Controllers course teaches students to interface with programmable logic controllers (PLCs). Programmable logic controllers are the brains of all modern automation technology systems. In this course students develop a working knowledge and skill set in the following competencies: ladder logic, programming standards, hardware selection, various inputs and outputs, communication, troubleshooting, setup and installation.

Objectives:
• Demonstrate a working knowledge of safety practices and procedures.
• Operate, install, maintain, and program programmable logic controller systems.
• Demonstrate working knowledge of ladder logic programming.
• Apply motor control logic within a programmable logic controller system.
• Apply timers and event sequencing within a programmable logic controller system.
• Configure inputs and outputs for various applications.
• Apply systems diagnostics and troubleshooting of programmable logic control circuit.

TEAM 1080 Applied System Diagnostics **2 Credits / 60 Clock-Hours**

The Applied System Diagnostics course covers the essentials of system diagnostics, the essence of what a technician does day to day. This course is designed to simulate real world troubleshooting scenarios. Students apply troubleshooting methodology by using all of the skills that they have learned so far in the program. Students are expected to properly diagnose, repair, and document their work on a variety of systems and challenges.

Objectives:
• Demonstrate a working knowledge of safety practices and procedures.
• Troubleshoot an entire system using pre-defined schematics.
• Complete standard technician documentation.
• Use troubleshooting instrumentation within multiple systems.

Supplemental Courses Varies by Institution

Bridgerland

TEAM 1012 Digital and Career Essentials **1 Credit / 30 Clock-Hours**

This course prepares students with the essential skills needed for success in both career and education pathways. Students will explore workforce resources through the Department of Workforce Services, set personal goals, and develop critical job application skills, including resumes, portfolios, networking, and interviewing. They will strengthen their digital literacy by completing assessments and improving typing, learning the fundamentals of Microsoft Word, Excel, Google Drive, Docs, and Sheets, and practicing flowcharting with tools like Draw.io. Students will also create a professional LinkedIn profile and online portfolio. The course concludes with an introduction to the Internet and network fundamentals. By the end of the course, students will be equipped with the digital, technical, and professional skills necessary to excel in today's workplace.

Objectives:
• Demonstrate career readiness skills by setting goals, completing job applications, preparing a professional resume and portfolio, and practicing effective networking and interviewing strategies.
• Improve digital literacy through assessments and practice in typing, word processing, spreadsheets, online collaboration tools, and flowcharting software.
• Develop a professional online presence by creating a LinkedIn account, building an online portfolio, and applying best practices for digital professionalism.
• Apply foundational technology knowledge by understanding internet and networking fundamentals and using digital tools to support career and workplace success.

TEAM 1100 Electric Motors and Drives **1 Credit / 30 Clock-Hours**

The Electric Motors and Drives course covers the identification of the operating characteristics and nameplate information of most types of electric motors. Students evaluate the operation of AC motors and DC Motors such as the series, shunt, and compound motors. Students use a mega□ohm□meter (meggar) to troubleshoot and test motor windings. This course introduces students to electric motor drives; they will install and program an electric motor drive for motor speed control, including ramp□up and ramp□down parameters. Students learn how three□phase alternating current (AC) is generated in Delta or Wye circuits. Lab work will reinforce the theory.

Objectives:
• Recognize various types of electric motors.
• Use the nameplate information on a motor for troubleshooting.
• Wire single and three□phase motors.
• Identify the operating characteristics, nameplate information, and troubleshooting procedures for single□phase motors, generators, AC/DC motors, control transformers, distribution systems, and Delta and Wye transformer configurations.
• Identify the operating characteristics, nameplate information, and troubleshooting procedures for three□phase motors – Delta or Wye connected 9 or 12 lead motors.
• Install and troubleshoot electric motor drives.
• Perform a complete motor control panel build and wiring exercise from a schematic.
• Use schematic drawings and test equipment to isolate problems in basic electric motor circuits.
• Follow a step□by□step troubleshooting process to solve problems within an integrated system.

TEAM 1110 Introduction to Industrial Robotics **2 Credits / 60 Clock-Hours**

In the Introduction to Industrial Robotics course, students are introduced to industrial robot architecture, arithmetic, programming, and simulation. Emphasis is placed on laboratory experiments dealing with simple robot programming, and program execution. In this project□based course, students are given industry□recognized simulation software for lab completion. A hands□on experience with real industrial robots is also required.

Objectives:
• Determine the working specifications and architecture of a robot arm.
• Calculate necessary arithmetic, geometry, and trigonometry relative to robot arms.
• Program a robot arm through industry specific simulation software.
• Test and execute robot arm programs in industry recognized simulators.
• Test and execute a robot arm program with industrial robots.
• Identify what types of robots are available for Industrial and servicing applications.

TEAM 1120 3D Modeling **2 Credits / 60 Clock-Hours**

In the 3D Modeling course, students learn concepts and techniques of 3D, feature□based, parametric modeling using SolidWorks as the modeling tool. Students learn the SolidWorks user interface, menus, toolbars, and commands used to create 2D sketches, 3D parts and assemblies. Learn how to build design intent into models with the use of relations, dimensions, and assembly mates. All concepts covered on the CSWA (Certified SolidWorks Associate) exam are taught. This course covers enough material to allow maintenance technicians to design brackets, tooling, precision fixtures, safety guarding and similar parts to keep existing equipment working and also to make improvements where needed.

Objectives:
• Use the SolidWorks program and user interface.
• Recognize the file formats and document properties used with SolidWorks.
• Customize SolidWorks to fit users' needs.
• Manipulate model views and orientation.
• Practice the fundamentals of fully defining 2D sketches and 3D geometry.
• Perform basic and advanced feature creation to build models.
• Create assemblies from modeled components.
• Create 2D drawings from parts and assemblies.

TEAM 1202 HVAC Refrigeration **2 Credits / 60 Clock-Hours**

In the HVAC Refrigeration course, students learn HVAC-R plus components and the principles of heating and air conditioning. Basic refrigeration systems and applications will be introduced, and preparation for the EPA 608 certification for refrigerant gases will be completed.

Objectives:
• Demonstrate knowledge of HVAC safety practices and procedures.
• Measure head pressure in a tube
• Heat and cool a room using a standard heat pump-based HVAC system.
• Set up and properly adjust a furnace system.
• Apply systems diagnostics and troubleshooting of HVAC systems.

TEAM 1300 Building Control Panels **3 Credits / 90 Clock-Hours**

In the Building Control Panels course, students will learn about control panel assembly, standards, skills, and practice. Industrial Control Panel standards are utilized, and special panel building tools are taught.

Objectives:
• Demonstrate knowledge of common control panel safety practices and procedures.
• Create a plan for a panel build project including electrical conduit capacity calculations, enclosure size, wire number and size, component placement.
• Demonstrate ability to correctly read and mark wiring prints.
• Demonstrate proper component layout and organization.
• Modify panel enclosures.
• Demonstrate proper wiring standards in regards to size, type, and color.
• Layout, mount, and wire a complete Control Panel while implementing UL508A standards.

TEAM 1504 Instrumentation Process Control **1 Credit / 30 Clock-Hours**

In the Instrumentation Process Control course students are introduced to the concepts and terminology of Instrumentation-Process Control using theory and a hands-on approach used in refineries, water treatment plants, boilers, HVAC, refrigeration systems, and many other temperature, pressure, level, flow, analysis, transmission and communication, and automatic control applications.

Objectives:
• Demonstrate knowledge of safety practices and procedures.
• Demonstrate the ability to set up multiple process control sensors.
• Demonstrate ability to manually and automatically adjust valves.
• Wire and actuate a valve positioner and solenoid valve.
• Setup common components such as control valves, regulators, dampers, actuators, positioners, solenoid valves, and variable frequency drives within a standard system.
• Calibrate and install temperature, pressure, level, and flow instruments.
• Use troubleshooting instrumentation competently within multiple systems.

TEAM 1915 Automation Technology Externship **3 Credits / 135 Clock-Hours**

The Automated Technology Externship course is a practical approach to acquiring new competencies and skills needed for a job in a real working environment that are either difficult to gain in a classroom setting or specific to certain employers. Students learn how to use particular tools or equipment specific to an employer in a live□work practice environment. Students learn workplace expectations, equipment operation, and any other skill they need to enhance their current skill sets and become more valuable to their employer. A supervisor and the student initially set objectives, experiences, and competencies that are also approved by the supervising institutional instructor. The supervisor evaluates and reports the student's strengths and weaknesses upon completion of the training. Instructors meet with students to review the evaluation reports.

Objectives:
• Apply the knowledge and skills attained in the program of study to real□world work experience.
• Work safely, effectively, and efficiently in installing, troubleshooting, and repairing the following systems: pneumatics, hydraulics, electric motors, electric motor controls, electronic, programmable logic controllers, mechanical applications, and blueprint reading.
• Work effectively in downtime situations.
• Communicate effectively with management, technicians, and production associates.
• Demonstrate proper work ethics, teamwork, and personal management skills.

TEAM 2810 Project Based Learning in Automation **1 Credit / 30 Clock-Hours**

The Project Based Learning in Automation course teaches students to develop and complete a project that focuses on an advanced industry skill. Students learn how to stay relevant in an evolving industry through identifying gaps in their skillset, setting measurable progress goals, and demonstrating their competency in a new skill.

Objectives:
• Identify automation skills needed in industry.
• Set measurable goals to increase competency in one of the identified advanced automation topics.
• Report on the project while following reporting requirements.
• Respond to feedback on the project by making adjustments.

TEET 1040 Electronics Assembly and Soldering **1 Credit / 30 Clock-Hours**

In the Electronics Assembly and Soldering course, students develop the ability to solder and desolder connectors, components, and printed circuit boards using industry standards. Topics include component identification, safety practices, soldering, desoldering, anti-static grounding, and surface mount techniques.

Objectives:
• Apply ESD industry safety and handling practices.
• Select the proper hand-tools and materials for an assembly procedure.
• Maintain and utilize soldering equipment.
• Prepare wire for electronic assemblies and complete wire splices.
• Solder wires to various terminals.
• Solder axial-leaded and multi-leaded through-hole components.
• Solder surface-mount components.
• Identify components, hardware, and wires.

TEET 1061 DC Electronics I **2 Credits / 60 Clock-Hours**

The course will cover direct current (DC) basics, electrical safety, components, Ohms law and power calculations, electrical measurements, series circuits, and power supplies. The course is a balance of theory, and hands-on, including measurements, troubleshooting, and circuit construction.

Objectives
• Recognize and describe electronic circuits, systems, and electrical hazards while practicing basic safety protocols.
• Use the relationships between voltage, resistance, and current to analyze DC circuits with Ohm's and power law equations.
• Use, test, and select various electronic components as needed to prototype circuits using schematic diagrams.
• Analyze the properties of magnetism.
• Utilize different types of multimeters to perform electronic measurements of voltage, current and resistance.
• Perform series circuits calculations and measurements, analyze circuits for faulty components.

TEET 1071 AC Electronics I **2 Credits / 60 Clock-Hours**

The course will cover the principles of alternating current (AC), inductance, capacitance, RL principles and circuits. It also covers passive filters, AC calculations and measurements, troubleshooting, usage of oscilloscopes and function generators.

Objectives
• Apply alternating current fundamentals of voltage, current, resistance and Ohm's law.
• Calculate Peak, Peak-to-Peak, RMS and Average values of sinusoidal signals.
• Apply function generators and oscilloscopes to AC circuits.
• Use schematic diagrams and symbols to prototype AC circuits.
• Explain the use of capacitors and inductors.
• Perform RL series and parallel circuit calculations and measurements and analyze phasor diagrams.
• Analyze the characteristics of series and parallel resistive/reactive RL circuits.

TEET 1100 Microcontrollers I **2 Credits / 60 Clock-Hours**

The Microconrollers I is a study in microcontroller architecture, arithmetic, programming, and interfacing. Emphasis placed on laboratory experiments dealing with microcontroller circuit build, program execution and interfacing. In this project-based course students will be given a platform to work with from several available on the market such as Arduino, Microchip, or others. Students will put together a series of projects that they design, build, program, and test for the instructor's approval.

Objectives:
• Design and build microcontroller circuits.
• Program and test microcontroller circuits using structured text.
• Apply peripheral interfacing in software and hardware.
• Use interrupt control.
• Use software development tools.
• Use a C based programming language.

TEET 1105 Microcontrollers II **2 Credits / 60 Clock-Hours**

The Microcontroller II course is an advanced study in microcontroller architecture, arithmetic, programming, and interfacing. Emphasis placed on laboratory experiments dealing with microcontroller circuit build, program execution and interfacing. This course includes advanced topics and projects such as communication interfaces, I2C bus, SPI bus, interfacing with liquid crystal displays, hardware and timer interrupts, and data logging with SD cards. An integrated final project is required.

Objectives:
• Design and build advanced microcontroller circuits.
• Program and test advanced microcontroller circuits.
• Apply advanced peripheral interfacing in software and hardware.

TEWT 1005 Welding Overview **3 Credits / 90 Clock-Hours**

This course is designed to provide students with the basic knowledge and experience to perform oxyacetylene welding, brazing, and cutting. It will teach fundamentals in a Shielded Metal Arc and Gas Metal Arc Welding. Gas Tungsten Arc Welding will also be introduced. Students will learn to run beads, groove, and fillet welds in butt, tee, and lap joints.

Objectives:
• Setup welding equipment.
• Perform safety inspections of equipment and accessories.
• Light torch and demonstrate oxidizing, neutral, and carborizing flames.
• Weld butt, lap, and tee joints in flat position oxyacetylene.
• Braze weld butt, lap, and tee joints.
• Weld butt, lap, and tee joints with arc welding processes.

Davis

TEAM 1015 Electronic Fundamentals for Industrial Automation **4 Credits / 120 Clock-Hours**

This course introduces students to the concepts and fundamentals of electronic devices, systems, and circuits. Students will learn the basics of DC/AC circuits; semiconductor and analog circuits; and microcomputers and learn how to use meters, oscilloscopes, and other measuring equipment. Students will also learn the skills required to make algebra calculations in an automation shop environment.

Objectives:
• Demonstrate knowledge of basic functionality of DC/AC circuits.
• Apply knowledge of basic components of semiconductor/analog circuits.
• Demonstrate knowledge of the basic purpose of digital gates, circuits, and systems.
• Use meters, oscilloscopes, and other measuring equipment.
• Perform US to metric conversions.
• Calculate surface and square measurements.
• Work with rational and real numbers.
• Add, Subtract, Multiply, and divide integers.
• Solve shop algebra calculation.

TEAM 1105 Electric Motors and Drives **3 Credits / 90 Clock-Hours**

This class covers identification of the operating characteristics and nameplate information of most types of AC/DC motors. This course will introduce students to Electric Motor drives, including the installation and programing of an electric motor drive for motor speed control, including ramp up and ramp down parameters. In addition, students will learn how three-phase alternating current (AC) is generated in Delta or Wye circuits. Students will gain knowledge about the distribution of electrical power in a manufacturing facility, including service feeders, branch circuits, and control circuits.

Objectives:
• Identify the operating characteristics, nameplate information and troubleshooting procedures for:
o Single-phase motors and generators.
o AC/DC motors, control transformers, and distribution systems.
o Delta and Wye transformer configurations.
o Three-phase motors – Delta or Wye connected, 9 or 12 lead motors.
• Install and Troubleshoot Electric Motors and Drives.

TEAM 1110 Introduction to Industrial Robotics **2 Credits / 60 Clock-Hours**

In the Introduction to Industrial Robotics course, students are introduced to industrial robot architecture, arithmetic, programming, and simulation. Emphasis is placed on laboratory experiments dealing with simple robot programming, and program execution. In this project□based course, students are given industry□recognized simulation software for lab completion. A hands□on experience with real industrial robots is also required.

Objectives:
• Determine the working specifications and architecture of a robot arm.
• Calculate necessary arithmetic, geometry, and trigonometry relative to robot arms.
• Program a robot arm through industry specific simulation software.
• Test and execute robot arm programs in industry recognized simulators.
• Test and execute a robot arm program with industrial robots.
• Identify what types of robots are available for Industrial and servicing applications.

TEAM 1170 UAV Drone Technology **3 Credits / 90 Clock-Hours**

Students in this course will learn cutting edge drone technology, function, assembly, programming, profitable and fun applications, and proper operation. Students will learn through hands-on practice of real-world applications of video, imaging, and mapping. Students will use propeller and fixed-winged simulators and drones to learn to properly operate drone technology. Students will learn to properly utilize FPV (First Person Video) with drones, ground control, connections, programming flight patterns, future of drones, and employment opportunities.

Objectives:
• Identify and apply drone technology and architecture.
• Demonstrate safety precautions and regulations for drone use.
• Build, program, and test a drone.
• Identify applications for drones.
• Apply peripheral sensors, equipment, and interfacing in software and hardware.
• Master skills to control and pilot drones.

TEAM 1300 Building Control Panels **3 Credits / 90 Clock-Hours**

In the Building Control Panels course, students will learn about control panel assembly, standards, skills, and practice. Industrial Control Panel standards are utilized, and special panel building tools are taught.

Objectives:
• Demonstrate knowledge of common control panel safety practices and procedures.
• Create a plan for a panel build project including electrical conduit capacity calculations, enclosure size, wire number and size, component placement.
• Demonstrate ability to correctly read and mark wiring prints.
• Demonstrate proper component layout and organization.
• Modify panel enclosures.
• Demonstrate proper wiring standards in regards to size, type, and color.
• Layout, mount, and wire a complete Control Panel while implementing UL508A standards.

TEAM 1500 Instrumentation Process Control **3 Credits / 90 Clock-Hours**

In the Instrumentation Process Control course students are introduced to the concepts and terminology of Instrumentation-Process Control using theory and a hands-on approach used in refineries, water treatment plants, boilers, HVAC, refrigeration systems, and many other temperature, pressure, level, flow, analysis, transmission and communication, and automatic control applications.

Objectives:
• Demonstrate knowledge of safety practices and procedures.
• Demonstrate the ability to set up multiple process control sensors.
• Demonstrate ability to manually and automatically adjust valves.
• Wire and actuate a valve positioner and solenoid valve.
• Setup common components such as control valves, regulators, dampers, actuators, positioners, solenoid valves, and variable frequency drives within a standard system.
• Calibrate and install temperature, pressure, level, and flow instruments.
• Use troubleshooting instrumentation competently within multiple systems.

TEAM 1550 Process Technology Equipment and System Operators **3 Credits / 90 Clock-Hours**

This course introduces students to the concepts and terminology of Process Technology Equipment and Systems using theory and a hands-on approach used in refineries, water treatment plants, boilers, and many other temperatures, pressure, level, flow, analysis, transmission and communication, and automatic control applications.

Objectives:
• Demonstrate knowledge of the basic functionality of process technology equipment.
• Apply knowledge of basic components of process technology equipment.
• Demonstrate knowledge of the basic purpose of process technology equipment.
• Use meters, and other measuring equipment associated with process technology.

TEAM 1600 Microcontroller and Microprocessor Programming **2 Credits / 60 Clock-Hours**

This course is a series of presentations/study in number systems and codes, microprocessor/microcontroller architecture, computer arithmetic, machine and assembler language programming, and microprocessor interfacing. Emphasis is placed on laboratory experiments dealing with machine/assembler language program execution and interfacing using an Arduino starter kit.

Objectives:
• Write assembly code programs.
• Apply peripheral interfacing in software and hardware.
• Utilize interrupt control and software polling.
• Use software development tools.

TEAM 1620 Electronics Assembly and Soldering **2 Credits / 60 Clock-Hours**

Electronics Assembly and Soldering offers you an opportunity to develop the ability to solder and desolder connectors, components, and printed circuit boards using industry standards. You will be introduced to topics including component identification, safety practices, soldering, desoldering, anti-static grounding, and surface mount techniques.

Objectives:
• Identify and place components according to a schematic.
• Demonstrate industry safety practices.
• Use standard anti-static grounding.
• Demonstrate through-hole soldering techniques.
• Demonstrate surface mount soldering techniques.

TEAM 1800 Renewable Energy **2 Credits / 60 Clock-Hours**

Students in this course will learn about alternative and sustainable energy sources. Students will conduct cost-benefit analysis on each form of alternative energy in order to determine what is practical on a large or small scale. Students will cover the efficiencies of each alternative energy source as well as what limitations exist in terms of extracting usable energy. Students will also learn how a fuel cell works and how they can power automobiles.

Objectives:
• Practice electrical safety and identify the effects electricity can have on the human body.
• Analyze energy production and consumption.
• Compare different energy sources.
• Describe how solar thermal energy sources operate.
• Explain solar and wind basics.
• Perform an analysis of incentives and costs.
• Explain fuel cell operation.
• Compare career opportunities.
• List non-renewable energy sources.
• Explain what resources are available through the National Renewable Energy Laboratory.
• Describe positive and negative ions.
• Describe how voltage, resistance, and current are related to each other.
• Read, draw, and identify electrical schematic systems.
• List the types of solar energy.
• Perform solar and wind installations.

TEAM 1810 Lean Manufacturing (Six Sigma) **1 Credit / 30 Clock-Hours**

In this course students will study lean manufacturing, ISO 9000 overview, manufacturing maintenance strategies, continuous process improvement, process design development, supply chain management, total productive maintenance, Five S overview, cellular manufacturing, and intro to six sigma, troubleshooting processes, and kaizen events. This includes discussions of the seven forms of waste and describing the role of a Quality Management System. Students will demonstrate the implementation of maintenance management strategies including reactive, corrective, predictive, preventive, reliability-centered and total productive maintenance.

Objectives:
• Describe ISO 9000.
• Describe Process analysis and improvement for a Quality Management System.
• Describe factors involved in selecting a maintenance approach.
• Distinguish between reactive, preventive, and predictive maintenance.
• Describe the impact of cost on the troubleshooting process.
• Differentiate between types of facility layouts.
• Explain the rules governing workplace safety.
• Identify the steps involved in 5S.
• Define root cause analysis.
• Distinguish between Six Sigma and lean initiatives.
• Identify the factors that determine cell design.
• Describe the importance of lean metrics.

TEAM 1820 Semiconductor Devices **4 Credits / 120 Clock-Hours**

Semiconductor Devices explores diodes and transistor principles. Throughout this course, you will study semiconductor theory, bipolar, and field effect device characteristics as well as modern thyristor devices. You will also examine the use of diodes in communication circuits and power supply applications, bias transistor circuits, the use of small-signal, power and FET amplifiers and measurement of frequency response to an amplifier.

Objectives:
• Identify the different diodes and their applications.
• Test, install and troubleshoot diodes.
• Identify rectifiers and power supplies.
• Identify the different transistors and their applications.
• Test, install and troubleshoot transistors.
• Identify amplifiers, field effect transistors (FETs), operational amplifiers, and analog oscillators.
• Identify silicon-controlled rectifiers (SCRs), diacs and triacs.
• Draw a complete system, use simulation software, and then construct the circuit on the lab trainer.

TEAM 1830 Aerospace Technician **2 Credits / 60 Clock-Hours**

In this course, students will identify and apply AF requirements of safety, lockout/tagout procedures, basic shop measurement tools, basic blueprint reading, Container Labeling, SDS procedures, and foreign objects damage and prevention for aircraft and aerospace equipment. Students will apply technical data, regulatory standards, theory, and lockout/tagout procedures. This course trains personnel, to include contractors, who perform direct or indirect maintenance actions/operations on aircraft, missiles, support equipment, components, or active taxiways/runways. Personnel such as security forces, fire department, medical and supply organization workers who may travel through aircraft, missile, support equipment, or component repair work centers, to include driving on active taxiways/runways, must also receive this training.
This course will also cover technical data and regulatory standards, theory, types, identification and inspection techniques, prone areas, reporting and documenting procedures, preventative compounds, removal and surface treatment.
This course will explore a list of essential packaging and production controls, review of guidelines describing the proper way to execute GMP records, examine the GMP personal hygiene requirements, clarify the four key product quality attributes, describe the purpose of GMP codes and regulations, and offer explanations of why companies implement GMP.

Objectives:
• Identify proper Occupational Safety and Health Administration’s (OSHA) right-to-know standards.
• Classify Safety Data Sheet (SDS) labels, including color, sections, and symbols according to the Globally Harmonized System.
• Identify possible safety hazards in the work environment.
• Demonstrate basic first-aid procedures Identify proper emergency evacuation practices.
• Identify proper OSHA lockout/tag out standards and devices.
• Demonstrate Global Harmonized System Container Labeling Procedures.
• Demonstrate proper use of basic shop precision measuring instruments.
• Demonstrate basic shop blueprint reading.
• Identify Initial foreign object damage awareness.
• Discuss and identify toxic metal awareness Identify good manufacturing practices.
• Track data of product and provide continuous improvements in manufacturing.
• Utilize quality control in manufacturing environment.

TEAM 1910 Automated Externship **2 Credits / 90 Clock-Hours**

Students participating in this course have the opportunity to gain valuable work experience in the Automation and Robotics industry while working under the supervision of a plant manager or maintenance technician. This experience will allow the student to observe and get hands-on experience troubleshooting and repairing equipment.

Objectives:
• Demonstrate competency of skills learned in the classroom and lab in a workplace setting.
• Successfully complete required externship hours in an automation and robotics workplace setting.

TEDR 1221 Production Drafting I **1 Credit / 30 Clock-Hours**

The Production Drafting I course delves into the practical realm of blueprint reading for manufacturing. Students will learn about industry standards to successfully interpret technical drawings.

Objectives:
• Identify and explain the components of a technical drawing.
• Interpret and analyze information presented on technical drawings.
• Interpret common symbols, abbreviations, and annotations used in technical drawings.
• Apply blueprint reading skills to solve practical problems.
• Redline technical drawings' by detecting errors, omissions, and discrepancies.

TEWT 1008 Welding for Manufacturing **2 Credits / 60 Clock-Hours**

Welding for Manufacturing includes the basic knowledge of Gas Metal Arc Welding (GMAW) and Shielded Metal Arc Welding (SMAW). During this course, you will study welding safety, protection, accident prevention, and troubleshooting. You will practice set-up, operation of equipment, positions, executions, and the workmanship needed for a basic weld.

Objectives:
• Describe oxy fuel cutting process terms.
• Demonstrate proper equipment setup, usage, cleaning, and break-down.
• Discuss and conduct safety inspections of equipment and accessories.
• List and describe oxy fuel cutting equipment.
• Perform setup, lighting, and use of oxy fuel cutting equipment.
• Demonstrate various cutting techniques including straight cuts, beveling, and gouging on various base metals.
• Name key terms for GMAW.
• Make GMAW-S (Short Circuit) Fillet Welds the 2F position.
• Make GMAW-S (Short Circuit) Groove Welds in the 2G position.
• Make GMAW-S (Short Circuit) V Groove Welds in the 2G position.
• List key terms for SMAW.
• Perform Fillet welds on mild carbon steel with E7018 welding.
• Perform Groove welds in the Flat (1G) and horizontal (2G) with 7018.

WKSK 1500 Job Seeking Skills **1 Credit / 30 Clock-Hours**

Job Seeking Skills explores how to prepare and successfully apply to potential career opportunities. During this course, you will be presented with essential job-seeking skills needed to find gainful employment.

Objectives:
• Create a professional resume, cover letter and reference sheet.
• Utilize online tools successfully to create an e-portfolio.
• Expand and develop networking skills.
• Utilize online resources effectively to find job openings.
• Demonstrate the ability to fill out job applications in a professional manner.
• Perform successfully in a job interview.
• Demonstrate appropriate follow-up procedures.

Mountainland

TEAM 1112 Rotating Machines **2 Credits / 60 Clock-Hours**

Students will learn the different types of motors that are used in industry and also the reasons why certain motors are used for different conditions. They will also learn how they are wired internally and externally. Students will also perform different measurements and do calculations to see how the motors perform under different loads.

Objectives:
• Connect and operate different industrial motors.
• Measure and calculate speed/torque.
• Calculate efficiency and power consumption.
• Graphing motors performance.

TEAM 1115 Robotics I **1 Credit / 30 Clock-Hours**

Robotics I will instruct students in robot safety, economics impacts, hardware, design and coding. Students will also design a robot and program to perform a task. They will discover the various fields and career opportunities in robotics.

Objectives:
• Practice Safety procedures.
• Operate robotic applications.
• Identify robotic components.
• Identify basic electrical operations.
• Program robot to perform a task.

TEAM 1310 Industrial Panel Wiring **2 Credits / 60 Clock-Hours**

Students will identify the design and wiring of industry standard control panels. They will use wiring organization to make a clean and professional control panel, using the various tools designed for this application.

Objectives:
• Troubleshoot and design circuits.
• Access and use wiring code.
• Connect and operate low voltage/high voltage.
• Use crimps, strippers, wire pullers, and various connections.

TEAM 2000 Programmable Logic Controllers II **3 Credits / 90 Clock-Hours**

During this course, students are introduced to advanced programming techniques of Programmable Logic Controllers. This course includes advanced topics of Programmable Logic Controllers not covered in the introductory course such as, process control, data acquisition, computer-controlled processes, variable speed drives, and networking. It may cover various software packages not included in the introductory class such as Allen Bradley 5000 series programming with hands-on labs and other advanced topics as needed to meet employer needs.

Objectives:
• Identify and discuss the basics of HMI programming.
• Identify Programmable Automation Controller principles and practices.
• Apply advanced topics of Programmable Logic Controllers in a lab setting.
• Learn advanced hardware and software principles as they apply to Programmable Logic Controllers.
• Demonstrate programming of advanced Programmable Logic Controllers on RSLogix 5000 software package to meet employer needs.

TEAM 2031 PLC Troubleshooting **1 Credit / 30 Clock-Hours**

Students will use and design basic Human-Machine Interface (HMI) programs, using Allen Bradly's "FactoryTalk". They will learn how to make the connections between the Programmable Logic Controllers (PLC) and HMI programs. They will also learn to navigate and use alarms. Students will read and troubleshoot PLC circuits, using basic troubleshooting techniques. They will use symptoms to diagnose troubles. They will also learn how to use multimeters to verify the working contrition of different components.

Objectives:
• Identify Factory Talk components.
• Configure communications.
• Create different control navigations.
• Create messages, alarms, and configure diagnostics.
• Identify PLC status indicators.
• Test and troubleshoot discrete input/outputs.
• Troubleshoot PLC faults.
• Test and troubleshoot Analog inputs/outputs.

Ogden-Weber

TEAM 1138 Vision Systems **1 Credit / 30 Clock-Hours**

This course will identify vision safety topics and basic functions of vision systems for two different platforms. It will demonstrate how to manipulate and use imaging software, as well as describe the set-up scanning features, profiles, and tools. It will also introduce 2□Dimensional and 3□Dimensional imaging.

Objectives:
• Navigate the Cognex Insight platform.
• Navigate the Keyence platform.
• Set up a vision program utilizing the most innovative systems.
• Demonstrate proper function of scanning, profile, pattern, and dimensioning tools.

TEAM 1140 Industrial Robotics **3 Credits / 90 Clock-Hours**

In this course, students will learn basic sensing and locomotion principles as they build and control a robotic arm. Students will learn about the different types of robots that are available for industrial and servicing applications program a robotic arm that will be used for selected activities from manual robot control to computer program mode. Students will determine how much current is required to lift different weights, how to measure the degrees of freedom, calculate maximum reach, and use the control panels.

Objectives:
• Determine the working specifications of a robot arm manipulator.
• Compare the robotic trainer to the human hand.
• Measure the degrees of freedom.
• Determine max vertical and horizontal reach.
• Utilize control panels.
• Identify what types of robots are available for Industrial and servicing applications.

TEAM 1300 Building Control Panels **3 Credits / 90 Clock-Hours**

In the Building Control Panels course, students will learn about control panel assembly, standards, skills, and practice. Industrial Control Panel standards are utilized, and special panel building tools are taught.

Objectives:
• Demonstrate knowledge of common control panel safety practices and procedures.
• Create a plan for a panel build project including electrical conduit capacity calculations, enclosure size, wire number and size, component placement.
• Demonstrate ability to correctly read and mark wiring prints.
• Demonstrate proper component layout and organization.
• Modify panel enclosures.
• Demonstrate proper wiring standards in regards to size, type, and color.
• Layout, mount, and wire a complete Control Panel while implementing UL508A standards.

TEAM 2146 Electrical Fluid Power Control Systems **2 Credits / 60 Clock-Hours**

Students will combine electrical controls with hydraulic and pneumatic circuits. They will read, design, and troubleshoot circuits that are using a wide range of devices used in industry. Students will explore components to set up a variety of industrial relay control circuits using ladder diagrams and Boolean logic. Some of these components include selector, pushbutton, limit, and pressure switches; control and timer relays; and hydraulic and pneumatic directional control valves.

Objectives:
• Explain the fundamentals of electro-hydraulic systems by identifying key components, such as relay controls and solenoid-operated hydraulic valves.
• Implement control systems using electrical devices like pushbuttons, selector switches, and indicator lights to achieve specific hydraulic circuit outcomes.
• Demonstrate proficiency in interpreting and creating ladder diagram schematics for electro-hydraulic control circuits.
• Analyze and design basic and intermediate hydraulic circuits incorporating electrical control relays, sequencing control, and time-delay functions.
• Demonstrate the operation of solenoid-operated directional control valves (DCVs) to manage the flow and direction in hydraulic circuits.
• Troubleshoot power and control circuits using sequencing, timer, and pressure control applications to ensure proper performance and function.

Salt Lake

TEAM 1520 Process Control Level/Flow **4 Credits / 120 Clock-Hours**

This course covers the most common types of process control systems, flow and liquid level. To include process control safety, instrument tags, piping and instrumentation diagrams, troubleshooting and level measurement. System control functions such as liquid level control, automatic control methods, basic flow measurement and control, and control loop performance using industry instrumentation.

Objectives:
• Identify definitions related to process control, safety, the elements of a process control system, and the general requirements of a control system.
• Explain instrument tags, block diagrams, piping and Instrumentation diagrams.
• Demonstrate the use of loop controllers, parameters, and manual operation.
• Use final control operation, I/P operation, and proportional control valves.
• Implement level measurement, level sensor operation, signal measurement, and display scaling.
• Troubleshoot process control systems.
• Utilize liquid level control.
• Implement methods of automatic control.
• Use basic flow measurement and control devices.
• Identify effective control loop performance.
• Use ultrasonic level measurement and control devices.
• Use differential pressure flow measurement and control devices.

TEAM 1580 Process Capstone Project **2 Credits / 60 Clock-Hours**

This course will require the identification and use of required hardware to build and setup a functional industry system for flow and level control of fluid such as water. The system must meet the stated criteria for flow/level measurement and control. The system will consist of reservoir tanks and industrial control instrumentation such as PID Controllers, Flow Transmitters, and level sensors.

Objectives:
• Setup, connect and program a basic process automatic level/flow control system.
• Calibrate and use an industrial flow transmitter.
• Setup and use level sensors.
• Use PID controllers for flow and level.
• Operate and demonstrate functioning process flow/level automatic control system.
• Submit all required project documentation.

TEAM 1610 Electric Motor Control Systems **4 Credits / 120 Clock-Hours**

This course teaches control of three-phase AC electric motors found in industrial applications, starting, reversing, jogging, and motor principles. Coverage of motor selection, diagrams, motor control devices, operation, installation, and troubleshooting. This course includes motor starter circuits, contactors, reduced voltage starting techniques, relays, braking, and variable frequency AC drives.

Objectives:
• Explain requirements for electrical safety in the workplace, protection against electric shock, grounding, and lockout procedures.
• Interpret electrical drawings including various symbols, abbreviations, ladder diagrams, wiring-single line- block diagrams, motor terminal connections, motor nameplate, and terminology.
• Identify motor transformers and distribution systems, power distribution systems, transformer principles, and transformer connections.
• Use various motor control devices including manually operated switches, mechanically operated switches, sensors, and actuators.
• Explain the use and operation of electric motors including motor principles, direct current motors, three-phase alternating current motors, single-phase alternating current motors, alternating current motor drives, motor selection, motor installation, motor maintenance and troubleshooting.
• Connect and operate various contactors and motor starters including magnetic contactors, considering contactor ratings, enclosures, and solid-state types.
• Install various types of relays including electromechanical control relays, solid-state relays, timing relays, latching relays, and relay control logic.
• Connect and operate motor control circuits including motor starting, motor reversing, jogging, motor stopping, and motor speed control devices.
• Follow industry guidelines such as National Electrical Code (NEC) for motor installation.
• Define motor torque and horsepower.
• Explain the operation of variable frequency AC drives and applications in industrial processes.
• Test a control transformer.
• Connect and operate a basic electric control circuit using common Input/output devices.
• Connect and operate basic timer control circuits.
• Troubleshoot motor control systems.

TEAM 1680 Motor Capstone Project **2 Credits / 60 Clock-Hours**

This course will require application of concepts learned in the motor course, to include the build and setup of all required hardware for a AC and DC motor control system. Requirements to include performance operation demonstration, safety, seal-in circuits, and forward and reverse operation. The system should comply with industry codes and best practices such as National Electrical Code (NEC).

Objectives:
• Properly setup, wire and operate an AC motor control system.
• Properly setup, wire and operate a DC motor control system.
• Demonstrate correct usage of required hardware/devices.
• Demonstrate wiring techniques to align with NEC.
• Properly setup and wire devices such as switches and lights.
• Submit all required project documentation.

TEAM 2010 Programmable Logic Controllers II **4 Credits / 120 Clock-Hours**

This course covers the usage of industry PLC hardware and software, such as Allen Bradley, covering the programming, setup and connection, operation, editing, for PLC motor control and other applications. This course will also cover programming using ladder logic, PLC instruction set, PLC Timers, Counter, Math, Program Control Instructions, Analog/Digital inputs and outputs.

Objectives:
• Create a PLC program using industry software such as Allen Bradley Studio 5000 software.
• Identify and explain the functions, and advantages of a programmable controller and its components.
• Identify industrial networks used for data communications and explain their function and operation. and type of network sed for data communications.
• Connect and configure PLC controllers for communications using PLC software.
• Use PLC programming software to open and download a program and monitor the status of a controller.
• Identify and explain PLC programming languages, program operation, and PLC memory organization.
• Explain the elements of project creation and organization, programming software, program analysis, and program documentation.
• Identify PLC motor control basics, seal-in program logic, data types and user-defined tags, interlock functions, and PLC discrete control of variable speed drives.
• Explain instructions for PLC timers and counters, non-retentive/retentive timers, time-driven sequencing, and counters.
• Demonstrate the use of event sequencing and continuous cycle logic, modes of operation, stop functions, and on/off process controls.
• Appropriately follow program control instructions, master control reset, subroutines, and jump and label instructions.
• Utilize math and data move instructions.
• Effectively use analog inputs and outputs, configuration, operation, scaling functions, comparison instructions and on/off control.
• Demonstrate the use of variable output applications, PWM temperature control, stepper motors, and absolute and relative modes.

TEAM 2025 HMI Programming **2 Credits / 60 Clock-Hours**

This course covers HMI panels, covering the programming, setup and connection, operation, editing, for basic terminal operation/human machine interface (HMI). The course will use and introduce industry hardware and software.

Objectives:
• Operate an HMI Panel Terminal, configure the IP Address, transfer an application using industry software.
• Use HMI application software to edit and create application displays and input and output objects.
• Explore HMI application editing, to include numeric input/output, displays, local messages, alarms, diagnostic messages, and information messages.
• Create a PLC program to support HMI applications.

TEAM 2040 PLC Troubleshooting **2 Credits / 60 Clock-Hours**

This course covers the Allen Bradley Compact Logix, PLC troubleshooting, identifying types of PLC faults, use of PLC diagnostics indicators, troubleshooting PLC power supplies, how to test and troubleshoot discrete input/out devices.

Objectives:
• Demonstrate PLC troubleshooting skills and techniques.
• Utilize PLC's status and diagnostic Indicators to determine the status of PLC operation.
• Demonstrate ability to troubleshoot a PLC power distribution system.
• Test discrete input/output devices.
• Use the force function to test a PLC discrete output device.
• Troubleshoot an industry PLC for faults.
• Use a six-step sequence to troubleshoot a PLC system.
• Troubleshoot a continuous cycle reciprocating motor PLC project.
• Troubleshoot a PLC-controlled machine with manual and automatic modes.
• Use the application diagnostics tools to find and replace an instruction.
• Analyze, test, and troubleshoot analog input/outputs.
• Analyze, test, and troubleshoot PWM applications.
• Analyze, test, and troubleshoot variable speed drives PLC applications.
• Analyze, test, and troubleshoot stepper motors PLC applications.

TEAM 2080 PLC Capstone Project **1 Credit / 30 Clock-Hours**

This course covers the usage of industry PLC and HMI hardware, as well as software. The capstone will be an industry application project, on the same level as the course lab projects. The course will require the design of a basic PLC project, the setup/wiring of all required PLC hardware and the programming. Documentation and final demonstration of the project will be required.

Objectives:
• Identify correct hardware to support the project.
• Setup and wire power supplies to support the PLC and HMI panel.
• Setup and wire all required input and output devices.
• Create a PLC program using industry software such as Allen Bradley Studio 5000 software.
• Create an HMI program using industry software such as Allen Bradley FactoryTalk View Studio – ME edition.
• Troubleshoot a PLC/HMI system.
• Operate and demonstrate a functioning PLC/HMI industry application system.
• Submit all required project documentation.

TEAM 2200 Troubleshooting Automated Systems **3 Credits / 90 Clock-Hours**

This course will cover the procedures and techniques for troubleshooting electrical, motor, and control circuits. To include safety, testing and fault determination and component replacement. Efficiency for making a repair will be covered and tracked for time and cost of repair.

Objectives:
• Troubleshoot and repair electrical relay circuits.
• Troubleshoot and repair motor circuits.
• Troubleshoot and repair control circuits.
• Follow safety procedures to avoid injury.
• Troubleshoot and repair common industrial circuits in a timely and efficient manner.

Snow

TEAM 2045 Programmable Logic Controllers Troubleshooting **2 Credits / 60 Clock-Hours**

The Programmable Logic Controllers Troubleshooting course teaches industry-relevant skills including how to operate, interface, program, and troubleshoot PLC systems for a variety of applications. Students will work with Allen Bradley, RSLogix 5000, and RSLinx, and HMI applications.

Objectives:
• Demonstrate PLC programming, operation, and troubleshooting.
• Explain PLC interfacing.
• Demonstrate PLC program editing.
• Use discrete input/output (I/O).
• Use counters/timer in PLC operation.
• Use BCD/LED in PLC operation.
• Develop program control instructions.

TEAM 2100 Industrial Mechanics II **2 Credits / 60 Clock-Hours**

The Industrial Mechanics II course teaches linear axis drives, clutches, brakes, piping, fittings, and valves. Students will learn relevant industrial skills including identifying, sizing, selecting, installation, operation, performing analysis, design, troubleshooting and maintenance.

Objectives:
• Select, install, troubleshoot, and maintain the following equipment:
o precision ball screws.
o linear ball bearings.
o linear axis slides.
o matched angular contract bearings.
o cam clutches.
o friction clutches.
o electric brakes.
o flywheels.
• Reference and interpret manufacturer's specification data.

TEAM 2110 Laser Shaft Alignment **2 Credits / 60 Clock-Hours**

The Laser Shaft Alignment course teaches how to set up, operate and apply laser shaft alignment to a variety of industrial applications. Topics include laser alignment systems, rough alignment, soft foot correction, alignment analysis and operation.

Objectives:
• Install and troubleshoot laser shaft alignment systems including, rough alignment and soft foot correction.

TEAM 2120 Vibration Analysis **2 Credits / 60 Clock-Hours**

The Vibration Analysis course teaches the bearings and gears used in heavy duty mechanical transmission systems. This course will emphasize linear axis drives, clutches, and brakes. In addition, this course teaches how to setup, operate, and apply laser shaft alignment to a variety of industrial applications. Topics include heavy-duty v-belt drives, v-belt selection and maintenance, synchronous belt drives, lubrication concepts, precision shaft alignment, couplings, and heavy-duty chain drives. Students will also learn the basics of vibration analysis used to determine when to perform maintenance of power transmission components.

Objectives:
• Take vibration measurements such as, velocity, acceleration, and spike energy and use these data in conjunction with trend analysis and severity charts to determine problems and their root causes.
• Operate and analyze laser shaft alignment systems including rough alignment, installation, and soft foot correction.
• Use a vibration meter to take a vibration reading, measure shaft misalignment vibration and shaft load imbalance vibration, measure belt drive vibration, interpret a vibration reading, and identify natural frequency.

TEAM 2130 Industrial Rigging **2 Credits / 60 Clock-Hours**

This course teaches a comprehensive set of industry-relevant skills including how to safely move loads of different shapes and sizes using a variety of methods. Students will learn skills including hoist operation, installation, maintenance, equipment movement, wire mesh slings, synthetic slings, knots, load turning and cranes.

Objectives:
• Identify appropriate rigging systems.
• Select and maintain the following sling types:
o Wire rope slings.
o Wire mesh slings.
o Chain slings.
o Synthetic Mesh Slings.
o Fiber and Synthetic Rope Slings.
• Install, operate, and maintain:
o block and tackle hoists.
o endless chain hoists.
o electric hoists.
o ratchet hoists.
• Describe spreader beams.
• Calculate sling efficiency.
• Identify, select, and install eyebolts.
• Identify, select, and install hooks.
• Explain load balance.
• Calculate load weight.
• Discuss rigging safety.
• Tie various rigging knots.
• Explain load turning and equipment movement.
• Demonstrate the use of protection pads, pry bars and pry trucks, hydraulic jacks, dollies, and roller bars.
• Demonstrate the use of various types of cranes.

TEAM 2140 Industrial Hydraulics Troubleshooting **3 Credits / 90 Clock-Hours**

The Industrial Hydraulics Troubleshooting course introduces industry-relevant hydraulic skills while showing the fundamentals of the hydraulic principles, hydraulic motors, and hydraulic formulas such as calculating theoretical pump flow rate. Students learning skills will include safety, operation, installation, troubleshooting, analysis of performance, and design hydraulic systems. Students will also be skilled in more advanced hydraulics.

Objectives:
• Identify basic hydraulic circuit components and explain their operation.
• Apply principles of Hydraulic Pressure and Flow in the development of hydraulic circuits.
• Complete circuits according to hydraulic schematics.
• Implement hydraulic speed and pressure control devices in circuits.
• Design and maintain hydraulic systems.
• Troubleshoot and repair damaged or faulty hydraulic systems.

TEAM 2150 Industrial Pumps **3 Credits / 90 Clock-Hours**

The Industrial Pumps course teaches a comprehensive set of industry-relevant skills including how to operate, install, maintain, troubleshoot, analyze performance, and select centrifugal pumps as well as system design.

Objectives:
• Describe centrifugal pump system operation and characteristics.
• Explain centrifugal pump performance, efficiency, and importance.
• Properly size and select pumps to meet the needs of given scenarios.
• Install and align pumps.
• Describe how to inspect and troubleshoot a centrifugal pump.
• Disassemble and inspect a centrifugal pump with a mechanical seal.

Southwest

TEAM 1510 Process Control Components and Systems **2 Credits / 60 Clock-Hours**

In this course, students are introduced to a wide variety of commonly used process control systems, controllers, Pumps, Valves, and Compressors. This is to include the diagnostics, tear down, repair, and rebuild of commonly used pump types and compressors. Students will learn about various types of valves, controllers, and their application, diagnostics, and repair procedures.

Objectives:
• Identify and diagnose control systems, components, and circuits.
• Identify, use, diagnose, and repair commonly used pumps and compressors.
• Design, use, control and program advanced process controllers and systems.

TEAM 1640 Electrical Systems II **1 Credit / 30 Clock-Hours**

In this course, students will study and master the wiring and use of real-world components such as a 3-phase motor, pushbuttons, switches, valves, and the use of a 24VDC control power supply. Students will use these components to study electrical control system wiring, pneumatic control circuit wiring, conductors, disconnects, and overcurrent protection and related applications. The combination of industrial components, and comprehensive curriculum will reinforce electrical wiring concepts and skills to build up the students' confidence and competence.

Objectives:
• Install control wiring in an electrical panel to control and manipulate commonly used components and motors.
• Understand, identify, and calculate the proper wire size, materials, and insulation required for different circuits, applications, and panel requirements.
• Install, wire, and monitor different types of control components and sensors. Including but not limited to contacts, momentary push buttons, limit switches, solenoids, and pressure switches.

TEAM 2005 Programmable Logic Controllers II **3 Credits / 90 Clock-Hours**

In this course, students are introduced to advanced programming techniques of Programmable Logic Controllers such as process control, data acquisition, computer-controlled processes, variable speed drives, and networking. Topics include various software packages not included in the introductory course with hands-on labs and other advanced topics as needed to meet employer needs.

Objectives:
• Identify and describe the basics of HMI programming.
• Identify and apply Programmable Automation Controller principles and practices.
• Apply advanced topics of Programmable Logic Controllers in a lab setting.
• Explain advanced hardware and software principles as they apply to Programmable Logic Controllers.
• Program advanced Programmable Logic Controllers on various software packages to meet employer needs.

TEAM 2210 Fabrication and Repair **3 Credits / 90 Clock-Hours**

In this course, students are introduced to proper fabrication and repair techniques of different types of metal, plastic, and other materials, using a variety of machine tools. Topics will also include technical drawings, tolerances, manufacturing fundamentals, tooling selections, and precision measurement practices. Throughout this course students will also perform repairs and replacement of components on commonly used machine tools related to industry.

Objectives:
• Explain, interpret, and design technical drawings using known and unknown specifications.
• Diagnose and troubleshoot commonly used machine tools.
• Understand and apply both basic and advanced uses, and manipulation of commonly used precision measuring instruments to determine if components and parts are within specifications and tolerances.
• Apply competencies to design, construct, and assess a fabrication project to prescribed specifications.

Tooele

TEAM 1148 Industrial Robotics **3 Credits / 90 Clock-Hours**

This course provides an introduction to the principles, operation, programming, and troubleshooting of industrial robotic systems, with a specific focus on FANUC material handling arms. Students will transition from theoretical concepts of automation to practical, hands-on application in a shop environment.

Objectives:
• Complete Core FANUC Training.
• Operate the FANUC arm to precisely control and manipulate the robot's motion.
• Diagnosing and resolving common robot faults and alarms.
• Perform essential preventative maintenance and data management tasks.

TEAM 1261 Manual Machining I **2 Credits / 60 Clock-Hours**

The Manual Machining I course teaches students to utilize precision measuring instruments, read blueprints, draw simple blueprints, and how to utilize a manual knee mill and lathe. Students will be required to demonstrate and practice the knowledge and skills gained by manufacturing various projects that will be held to specified tolerances.

Objectives:
• Demonstrate a working knowledge of safety practices and procedures.
• Utilize precision measuring instruments to document part dimensions on a hand-drawn blueprint
• Use of a manual lathe to machine basic precision round parts that include drilling, tapering, grooving, threading, and basic boring.
• Use of a manual knee mill to make basic precision parts utilizing end mills, drills, and taps.

TEAM 1271 Manual Machining II **3 Credits / 90 Clock-Hours**

Manual Machining II builds off of Manual Machining I. Students will take the knowledge they gained from Introduction to Manual Machining and build on it by demonstrating their skills in a cumulative project.

Objectives:
• Demonstrate a working knowledge of safety practices and procedures.
• Utilize precision measuring instruments to document part dimensions on a hand-drawn blueprint
• Use of a manual lathe to machine basic precision round parts that include drilling, tapering, grooving, threading, and basic boring.
• Use of a manual knee mill to make basic precision parts utilizing end mills, drills, and taps.

TEAM 1280 Welding for Automation Technology I **2 Credits / 60 Clock-Hours**

This course introduces welding into automation technology. Key topics include general shop safety, cutting processes, essential terminology, and foundational concepts in automated welding systems.

Objectives:
• Demonstrate a working knowledge of safety practices and procedures.
• Perform basic metal cutting using an Oxy-fuel Torch, and Plasma Cutter.
• Demonstrate knowledge of welding equipment, filler rods, shielding gases, and the proper setup of various welding systems.

TEAM 1380 Welding for Automation Technology II **2 Credits / 60 Clock-Hours**

This course focuses on the setup, operation, and practical applications of automated Shielded Metal Arc Welding (SMAW) systems. Students examine the advantages and limitations of SMAW automation and receive hands-on training in industry-standard automated SMAW procedures.

Objectives:
• Demonstrate setup and configuration of Shielded Metal Arc Welding (SMAW) systems, including equipment calibration and parameter selection.
• Operate automated SMAW equipment safely and efficiently while applying industry-standard procedures to produce consistent, high-quality welds.
• Evaluate the advantages, limitations, and appropriate applications of SMAW automation in welding production environments.

TEAM 1480 Welding for Automation Technology III **2 Credits / 60 Clock-Hours**

This course prepares students to work with GTAW systems for aluminum and stainless steel fabrication. Students study electrode properties and preparation, tip geometries, and the selection of welding parameters needed to meet industry-standard welding procedures.

Objectives:
• Set up and configure automated GTAW systems for aluminum and stainless steel, including electrode selection, preparation, and tip geometry adjustments.
• Select, adjust, and apply appropriate welding parameters to meet industry-standard GTAW procedure requirements.
• Operate automated GTAW equipment safely and efficiently to produce consistent, high-quality welds in aluminum and stainless steel applications.

USU - Eastern

TEAM 1100 Electric Motors and Drives **1 Credit / 30 Clock-Hours**

The Electric Motors and Drives course covers the identification of the operating characteristics and nameplate information of most types of electric motors. Students evaluate the operation of AC motors and DC Motors such as the series, shunt, and compound motors. Students use a mega□ohm□meter (meggar) to troubleshoot and test motor windings. This course introduces students to electric motor drives; they will install and program an electric motor drive for motor speed control, including ramp□up and ramp□down parameters. Students learn how three□phase alternating current (AC) is generated in Delta or Wye circuits. Lab work will reinforce the theory.

Objectives:
• Recognize various types of electric motors.
• Use the nameplate information on a motor for troubleshooting.
• Wire single and three□phase motors.
• Identify the operating characteristics, nameplate information, and troubleshooting procedures for single□phase motors, generators, AC/DC motors, control transformers, distribution systems, and Delta and Wye transformer configurations.
• Identify the operating characteristics, nameplate information, and troubleshooting procedures for three□phase motors – Delta or Wye connected 9 or 12 lead motors.
• Install and troubleshoot electric motor drives.
• Perform a complete motor control panel build and wiring exercise from a schematic.
• Use schematic drawings and test equipment to isolate problems in basic electric motor circuits.
• Follow a step□by□step troubleshooting process to solve problems within an integrated system.

TEAM 1110 Introduction to Industrial Robotics **2 Credits / 60 Clock-Hours**

In the Introduction to Industrial Robotics course, students are introduced to industrial robot architecture, arithmetic, programming, and simulation. Emphasis is placed on laboratory experiments dealing with simple robot programming, and program execution. In this project□based course, students are given industry□recognized simulation software for lab completion. A hands□on experience with real industrial robots is also required.

Objectives:
• Determine the working specifications and architecture of a robot arm.
• Calculate necessary arithmetic, geometry, and trigonometry relative to robot arms.
• Program a robot arm through industry specific simulation software.
• Test and execute robot arm programs in industry recognized simulators.
• Test and execute a robot arm program with industrial robots.
• Identify what types of robots are available for Industrial and servicing applications.

TEAM 1300 Building Control Panels **3 Credits / 90 Clock-Hours**

In the Building Control Panels course, students will learn about control panel assembly, standards, skills, and practice. Industrial Control Panel standards are utilized, and special panel building tools are taught.

Objectives:
• Demonstrate knowledge of common control panel safety practices and procedures.
• Create a plan for a panel build project including electrical conduit capacity calculations, enclosure size, wire number and size, component placement.
• Demonstrate ability to correctly read and mark wiring prints.
• Demonstrate proper component layout and organization.
• Modify panel enclosures.
• Demonstrate proper wiring standards in regards to size, type, and color.
• Layout, mount, and wire a complete Control Panel while implementing UL508A standards.

TEAM 1500 Instrumentation Process Control **3 Credits / 90 Clock-Hours**

In the Instrumentation Process Control course students are introduced to the concepts and terminology of Instrumentation-Process Control using theory and a hands-on approach used in refineries, water treatment plants, boilers, HVAC, refrigeration systems, and many other temperature, pressure, level, flow, analysis, transmission and communication, and automatic control applications.

Objectives:
• Demonstrate knowledge of safety practices and procedures.
• Demonstrate the ability to set up multiple process control sensors.
• Demonstrate ability to manually and automatically adjust valves.
• Wire and actuate a valve positioner and solenoid valve.
• Setup common components such as control valves, regulators, dampers, actuators, positioners, solenoid valves, and variable frequency drives within a standard system.
• Calibrate and install temperature, pressure, level, and flow instruments.
• Use troubleshooting instrumentation competently within multiple systems.

TEAM 2000 Programmable Logic Controllers II **3 Credits / 90 Clock-Hours**

During this course, students are introduced to advanced programming techniques of Programmable Logic Controllers. This course includes advanced topics of Programmable Logic Controllers not covered in the introductory course such as, process control, data acquisition, computer-controlled processes, variable speed drives, and networking. It may cover various software packages not included in the introductory class such as Allen Bradley 5000 series programming with hands-on labs and other advanced topics as needed to meet employer needs.

Objectives:
• Identify and discuss the basics of HMI programming.
• Identify Programmable Automation Controller principles and practices.
• Apply advanced topics of Programmable Logic Controllers in a lab setting.
• Learn advanced hardware and software principles as they apply to Programmable Logic Controllers.
• Demonstrate programming of advanced Programmable Logic Controllers on RSLogix 5000 software package to meet employer needs.