Advanced Systems Technology Program

Organization: Washburn Institute of Technology

Program Number: 47.0303

Instructional Level: Certificate

Instructional Area: Industrial Technology

Target Population
Secondary and post-secondary.

Description
This program prepares individuals to apply technical knowledge and skills to repair and maintain industrial machinery and equipment such as pumps, electric motors, conveyor systems, and production machinery. Instruction includes electrical theory, wiring, motor controls, 3-Phase/Single Phase/DC motors, blueprint reading, programmable logic controllers (PLC), hydraulics and pneumatics, mechanical systems, welding, machining, and robotics.

Dress code requires students to wear closed-toed shoes, Washburn Tech program shirt, and safety glasses. Shorts are not acceptable for pants.

Entry Requirements
WorkKeys Entrance Assessment: Applied Math – Level 6
WorkKeys Entrance Assessment: Reading for Information – Level 5

Prerequisites
MAT101 – Tech Math I
MAT102 - Tech Math II (Level 6 in Applied Math or a C or better in MAT101 to enter MAT102.
PST101 - Applied Physics

Assessment Plan
Assessment is an integral part of the educational process at Washburn Tech and accurate feedback is an important tool in continuously improving the institution’s technical programs. Students can expect to participate in assessment activities prior to entry into programs, within specific courses and following program completion for specific fields of study.
Grading Criteria
90% or higher  A
80% to 89%  B
70% to 79%  C
60% to 69%  D
Less than 60%  F

Grading Rationale
Class sessions and assignments will include daily homework, in-class review of homework, quizzes. Grades will be based on: Attendance and general participation, daily homework, quizzes and tests and final exam

Student Learning Outcomes
A. Communicate effectively.
B. Integrate technology.
C. Learn effectively - use academics effectively.
D. Demonstrate cooperative/teamwork skills.
E. Apply safety.
F. Think critically and creatively.
G. Demonstrate responsible work ethics.

Program Outcomes
A. Analyze problems using technical diagrams and prints.
B. Apply all safety guidelines appropriate for each course in order to prepare students to work safely in industrial environments.
C. Assess problems to determine if they are electrical or mechanical in nature.
D. Demonstrate skills and knowledge needed to work in the highly technical environment.
E. Acquire the basic skill needed to expand and gain the knowledge for a more complex application of Advanced Systems Technology.
F. Develop skills needed to read and understand technical manuals.
G. Motivate learning in technical and employability skills.

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<thead>
<tr>
<th>Course #</th>
<th>Course Title</th>
<th>Credit Hours</th>
<th>Required</th>
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<tbody>
<tr>
<td>IND104</td>
<td>Basic Electricity I</td>
<td>3</td>
<td>Yes</td>
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<tr>
<td>IND108</td>
<td>Mechanical Systems I</td>
<td>3</td>
<td>Yes</td>
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<tr>
<td>IND112</td>
<td>Fluid Power I</td>
<td>3</td>
<td>Yes</td>
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<tr>
<td>IND116</td>
<td>Lathe/Mill/Grind for I.M.</td>
<td>3</td>
<td>Yes</td>
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<tr>
<td>IND144</td>
<td>Basic Electricity II</td>
<td>3</td>
<td>Yes</td>
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<tr>
<td>IND148</td>
<td>Mechanical Systems II</td>
<td>3</td>
<td>Yes</td>
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<tr>
<td>IND152</td>
<td>Electrical Control Systems I</td>
<td>3</td>
<td>Yes</td>
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<tr>
<td>IND156</td>
<td>Welding SMAW</td>
<td>3</td>
<td>Yes</td>
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### Program Course Descriptions

**IND104 Basic Electricity I (3 credits)**
This course is an introduction to electricity, basic electrical components and their characteristics, circuit schematics and basic analysis of series and parallel DC circuits. Hands-on labs help guide student learners to assimilate this material.

**IND108 Mechanical Systems I (3 credits)**
This course provides understanding of mechanical energy transmission concepts along with lab experience to operate, install, analyze performance, and design basic mechanical transmission systems using chains, v-belts and spur gears. Students also learn to safely move loads of different shapes and sizes using a variety of methods.

**IND112 Fluid Power I (3 credits)**
This course provides fundamentals of pneumatics, air compressors, control valves, pneumatic cylinders, and electro-pneumatic controls; and basic pump principles, centrifugal pumps, magnetic drive pumps, diaphragm pumps, metering pumps and pump seals. Students learn how to operate, install, troubleshoot, analyze performance, and design basic pneumatic systems and pump systems.

**IND116 Lathe/Mill/Grind for Industrial Maintenance (3 credits)**
This course covers fundamental manual machine operator skills and basic precision measuring techniques. Specific course topics include machines, tools and measurements to produce an end product. Participants work independently and as small teams in completing the hands-on lab activities.

**IND144 Basic Electricity II (3 credits)**
This course provides understanding of analysis of series and parallel DC and AC circuits; combination of resistive, inductive and capacitive circuits and industrial applications of these circuits. Hands on labs help guide student learners to assimilate this material.

**IND148 Mechanical Systems II (3 credits)**
This course provides understanding of mechanical energy transmission concepts along with lab experience to operate, install, analyze performance, and design mechanical drive systems using right angle gears, bearings and couplings. Students learn how to setup and operate laser shaft alignment and apply vibration analysis to various power transmission systems.

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<th>Course Code</th>
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<th>Credits</th>
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<tbody>
<tr>
<td>IND204</td>
<td>Electrical Control Systems II</td>
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<td>Yes</td>
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<tr>
<td>IND208</td>
<td>Fluid Power II</td>
<td>3</td>
<td>Yes</td>
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<tr>
<td>IND212</td>
<td>Electrical Control Systems III</td>
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<tr>
<td>IND216</td>
<td>Programmable Logic Controllers I</td>
<td>3</td>
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<td>IND244</td>
<td>Process Control</td>
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<tr>
<td>IND248</td>
<td>Programmable Logic Controllers II</td>
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<tr>
<td>IND252</td>
<td>Robotics I</td>
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<tr>
<td>IND256</td>
<td>Robotics II</td>
<td>3</td>
<td>Yes</td>
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<tr>
<td>IND280</td>
<td>Ind Tech OJT (Clinical-Optional)</td>
<td>3</td>
<td>No</td>
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Advanced Systems Technology Program
IND152 Electrical Control Systems I (3 credits)
This course is an introduction to electrical control systems with focus on control devices, electric motors, manual/electric/magnetic motor control and overload/over current protection and monitoring. Lab experience helps develop skills to operate, install, design, and troubleshoot AC electric motor control circuits for various applications.

IND156 Welding SMAW (3 credits)
This course introduces basic concepts of general welding. Hands-on lab activities are provided for the participant to apply knowledge and develop skills in the following areas: Shop Safety, Cutting (oxy/acetylene) SMAW (Shielded Metal Arc Welding). Participants work independently and as small teams in completing the lab activities.

IND204 Electrical Control Systems II (3 credits)
This course provides an understanding of Reversing Motor Circuits, Solid State Devices and System Integration, Timing and Counting Functions, Relays and Solid State Starters, Sensing Devices and Controls. Hands-on labs help guide student learners to assimilate this material.

IND208 Fluid Power II (3 credits)
This course focuses on understanding of hydrodynamics, hydraulic principles, hydraulic circuitry and diagrams, piping, hydraulic valves and actuators, accumulators, hydraulic circuit maintenance and fluid maintenance. Students learn to operate, install, analyze performance, and design hydraulic and electrohydraulic systems.

IND212 Electrical Control Systems III (3 credits)
This course focuses on motion and position control systems; servo motors and servo system feedback devices. Hands on labs help develop skills to operate, install, tune, and troubleshoot major types of AC and DC drives.

IND216 Programmable Logic Controllers I (3 credits)
This course is an introduction to programmable logic controllers and PLC control of analog input and output devices. The course covers basic PLC programming and troubleshooting with live devices and their use in industrial, commercial, and residential applications.

IND244 Process Control (3 credits)
This course provides understanding of different types of process control systems like temperature, flow and level control. The course includes process control principles, thermocouples, RTD's, temperature measurement devices, On/Off temperature controllers, programmable process heat controllers, transmitters, process loop test equipment and final control elements. Using this information students learn to construct, test and operate systems found in industrial applications.

IND248 Programmable Logic Controllers II (3 credits)
This course builds on the knowledge gained in 'Programmable Logic Controllers I' and focuses on the fundamentals of installing and troubleshooting of industrial communications networks using Control Net; operation, installation, configuration and troubleshooting of the Device Net field-device network; and Human-to-Machine Interface (HMI) using Allen Bradley and Control Logix PLCs.
IND252 Robotics I (3 credits)
This course is an introduction to robotics which provides an understanding of basic robotics principles, parts of robots, degrees of freedom, programming methods and languages. Students learn to home a robot, test teach points, construct flow charts and design simple robot programs for different applications.

IND256 Robotics II (3 credits)
This course builds on the knowledge gained in Robotics I and focuses on sensors, end effectors, control systems and maintenance. Students learn advanced commands and operators, create simulation objects, configure objects and design work cells.

IND280 Ind Tech OJT - OPTIONAL (3 credits)
This course is optional.

ADA Notification Statement and Disability Services:
The Testing/ADA Coordinator office is responsible for assisting in arranging accommodations and for identifying resources at Washburn Tech for persons with disabilities. Qualified students with disabilities MUST register and provide documentation with the office to be eligible for services. New requests for accommodations should be submitted two months or more prior to the date services should begin by contacting the Testing/ADA Coordinator's office as soon as a need may arise. Depending on the accommodation request, four to eight weeks lead time may be needed for timely and effective provision of services. Testing/ADA Coordinator coordinates and assists in arranging services it deems appropriate for eligible students on a case-by-case basis.
If you are a student with a disability that may substantially limit your ability to participate in this class and believe you will need accommodations, it is your responsibility to contact:

Testing/ADA Coordinator            Phone:    785-228-6356
E-Mail:   ssscoordinator@washburn.edu