Integrated Systems Technology

at Columbus State Community College

COLUMBUS STATE

INTEGRATED SYSTEMS TECHNOLOGY

Welcome

The Integrated Systems Technology (IST) e-learning program at Columbus State Community College is a blended approach to technical development. We mix online curriculum with hands-on lab instruction to accelerate your learning. The web-based training is a competency-based program available 24 hours per day. You may access coursework within the lab or at your location. After completion of the virtual training, a series of hands-on lab experiences will be conducted in the IST lab located at Columbus State during scheduled lab hours.

Getting Started

- After completing a registration form, you will receive an email welcoming you to Columbus State Community College online/lab learning. This email will contain an activation code and instructions on how to activate your account.
- Once the account has been activated, you will have up to six months to access the e-learning curriculum.
- IMPORTANT! To see the curriculum, you must notify the IST coordinator that your registration is complete.

The Basics

- The IST e-learning program consists of topics such as AC/DC electrical systems and basic pneumatics. Each topic comprises a series of learning activity packets (LAPs). For example, AC/DC Electrical System LAP 1 is Basic Electrical Circuits. Each LAP is broken down into segments, and each segment consists of objectives, activities, and skills.
- The IST team will set up a training plan for you to complete a certain number of LAPs in a specified timeframe. For example, complete AC/DC Electrical System LAPs 1 and 2 during Week One, complete LAP 3 and 4 during Week Two, etc.
- A pre-quiz must be taken before launching an LAP.
- After completion of the pre-quiz, the launch button will allow access to the educational content.
- Upon completing the LAP, a post-quiz must be completed.
- In some instances, programs include virtual labs. Those labs are to be completed using virtual trainers as part of the online/lab curriculum.
- You will have access to an online scheduling tool to reserve hands-on learning equipment upon completion of at least one web-based LAP. The scheduling tool will notify faculty and staff about what you will be completing.

Contact Information

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INTEGRATED SYSTEMS TECHNOLOGY Certificate Programs

IST CERTIFICATES	IST COURSES	COURSE HOURS	COST
Electrical Certificate 1	AC/DC Electrical Systems Electric Motor Control Variable Frequency AC Drives	60	$2,400
Electrical Certificate 2	Electrical Wiring Systems Rotating Electric Machines	30	$1,200
Allen-Bradley ControlLogix 5500 Certificate	*Allen-Bradley ControlLogix 5500*	42	$1,440
PLC Certificate Programmable Controllers	*Allen-Bradley CompactLogix*	49	$1,680
Fluid Power Certificate Hydraulics	Basic, Intermediate, and Advanced Hydraulics	36	$1,440
Fluid Power Certificate Pneumatics	Basic, Intermediate, and Advanced Pneumatics Pneumatic Troubleshooting	51	$2,040
Plastics Technology Certificate	*Manufacturing Processes*	18	$600
Mechanical Certificate 1	Mechanical Drives 1 Mechanical Drives 2 Mechanical Drives 3	63	$2,520
Process Control Certificate	Pump Systems Process Control System Thermal Process Control	67	$2,760
Instrumentation Certificate	PLC Troubleshooting Process Control System ControlLogix Process Control	72	$3,120
Multicraft Technician Certificate	AC/DC Electrical System Electric Motor Control Basic Pneumatics Electronic Sensors Mechanical Drives 1 Intro to Welding and Welding Concepts	96	$3,840
Maintainer/Operator Certificate	Safety Awareness Measurement and Gauging Mechanical Drives System 1 Basic Pneumatics AC/DC Electrical Systems Electric Motor Control 21st Century Job Skills	30	$1,200

Electrical Certificate 1

60 Hours | Theory/Hands-on

AC/DC Electrical Systems

AC/DC Electrical Course teaches fundamentals of AC/DC electrical systems used for power and control in industrial, commercial, agricultural, and residential applications using virtual training technology. Students learn industry-relative skills included in subject areas such as:

1. Basic Electrical Circuits
2. Electrical Measurements
3. Circuit Analysis
4. Inductance and Capacitance
5. Combination Circuits
6. Transformers

Variable Frequency AC Drives

Variable frequency AC drives teaches variable frequency AC solid-state control of 3-phase electric motors. Learners develop knowledge in the operation, installation, performance analysis, troubleshooting, and design of AC solid state control using 2-wire, 3-wire, manual, and open-loop speed control. Highlights motor jogging and dynamic braking as well as programmable acceleration and deceleration.

1. Introduction to Variable Frequency AC Drives
2. Variable Frequency AC Drives - Speed and Torque Control
3. Variable Frequency AC Drives - Acceleration/Deceleration and Braking
4. Variable Frequency AC Drives - Fault Diagnostics and Troubleshooting

Electric Motor Control

Electric motor control teaches electric relay control of AC electric motors found in industrial, commercial, and residential applications. Learners gain understanding of the operation, installation, design, and troubleshooting of AC electric motor control circuits for many common applications. Develops skills in interpreting schematics, system design, motor start/stop circuits, motor sequence control, reversing motor control, and motor jogging. Safety is emphasized throughout, highlighting motor safety, lockout/tagout and safety interlocks. Students learn industry-relevant skills included in subject areas such as:

1. Introduction to Electric Motor Control
2. Manual Motor Control and Overload Protection
3. Control Transformers
4. Control Ladder Logic
5. Control Relays and Motor Starters
6. Introduction to Troubleshooting
7. Systems Troubleshooting
8. Reversing Motor Control
9. Automatic Input Devices I
10. Basic Timer Control: On-Delay and Off-Delay

Electrical Certificate 2

30 Hours | Theory/Hands-on

Electrical Wiring Systems

Industrial Electrical Wiring introduces concepts used in many industry tasks in electrical wiring. Learners will describe the function of electrical prints, panels, the wiring between panels, and wire color coding. They will also learn concepts in control system wiring fundamentals, wiring between and outside panels, panel wiring, wire bundling, and experience a project in how to wire an electrical machine.

1. Introduction to Electrical Control Wiring
2. Electrical Control System Wiring

Rotating Electric Machines

Basic electrical Machines introduces electrical circuits and works through many industry tasks in Electrical Systems.

1. DC Series Motors
2. DC Shunt and Compound Motors
3. Motor Speed and Torque
4. Motor Performance
5. Split-Phase AC Motors
6. Capacitor-Start AC Motors
7. Permanent Capacitor and Two-Capacitor Motors
8. Three-Phase AC Induction Motors

Allen-Bradley ControlLogix 5500 Certificate

42 Hours - Theory/Hands-on

This course will teach how to design, program and operate a PLC to control a number of process applications used by industries all over the world. The skills learned are in high demand everywhere today. These skills include orientation, operation, programming, memory organization, program analysis, motor control, discrete I/O interfacing, troubleshooting, systems troubleshooting, event sequencing, application development timer instructions, counter instructions, program control instructions, and math and data move instructions.

1. Introduction to Programmable Controllers
2. Basic PLC Programming
3. PLC Motor Control
4. Discrete I/O Interfacing
5. Introduction to PLC Troubleshooting
6. PLC Systems Troubleshooting
7. Event Sequencing
8. Application Development
9. PLC Timer Instructions
10. PLC Counter Instructions
11. Program Control Instructions
12. Math and Data Move Instructions

PLC Certificate
Programmable Controllers

49 Hours - Theory/Hands-on

Programmable Logic Controllers (PLC) are the backbone of automated processes in modern industry. This course covers program editing, basic PanelView Plus terminal operation, PLC motor control, analog inputs and outputs, and much more.

Allen-Bradley CompactLogix

1. Introduction to Programmable Controllers
2. Basic PanelView Plus Terminal Operation
3. PLC Programming Operations
4. PLC Programming
5. PLC Motor Control
6. PLC Timer and Counter Instructions
7. Event Sequencing
8. Program Control Instructions
9. Math and Data Move Instructions
10. PanelView Plus Application Editing
11. PanelView Plus Application Editing 2
12. Analog Inputs
13. Analog Outputs
14. Variable Output Applications

Fluid Power Certificate Hydraulics

36 Hours | Theory/Hands-on

Basic Hydraulics

Basic hydraulics introduces hydraulic power use and application, allowing learners to develop skills and knowledge needed to apply hydraulics in modern industry. It takes learners through key topics and skills in hydraulic power & safety, hydraulic circuits, hydraulic schematics, the principles of hydraulic pressure and flow, and hydraulic speed control circuits. It covers pumps, fluid friction, how to connect hydraulic circuits, hydraulic cylinders and valves (including needle valves), and a wide array of hydraulic applications.

1. Hydraulic Power Systems
2. Basic Hydraulic Circuits
3. Principles of Hydraulic Pressure and Flow
4. Hydraulic Speed Control
5. Pressure Control Circuits

Intermediate Hydraulics

Intermediate hydraulics builds on basic hydraulic skills teaching hydraulic components and system applications. Students will learn industry-relevant skills related to new topics including operation, installation, performance analysis, and design. These topics include accumulator sizing, system design, circuit applications, component operation/ installation, pilot-operated directional control valves (DCVs), 2-stage directional control valves, cam-operated directional control valves (DCVs), DCV spool center types and applications, cylinder types and mountings, pressure-compensated flow control valves, pilot-operated check valves, direct-operated relief valves, non-compensated flow control valves, rapid traverse slow feed circuits, cylinder sequencing, remote pressure control, pump unloading circuits, and p-port check valves.

1. Hydraulic DCV Applications
2. Hydraulic Cylinder Applications
3. Hydraulic Relief Valve Operation
4. Hydraulic Check Valve Applications

Advanced Hydraulics

The eLearning course adds to the basic and intermediate hydraulic skills teaching advanced applications. Students will learn industry-relevant skills related to these new topics including operation, installation, performance analysis, maintenance, and design. These topics include heat exchangers, reservoirs, fluid conductors, fluid conditioning, filtration, motor performance, pump performance, system design, and maintenance

1. Hydraulic Motor Applications
2. Hydraulic Pump and Motor Performance
3. Fluids and Conditioning

Fluid Power Certificate
Pneumatics

51 Hours | Theory/Hands-on

Basic Pneumatics

Basic pneumatics prepares learners to work intelligently in industry with pneumatic applications. It introduces pneumatic power and takes learners through key topics and skills in pneumatic power and safety, pneumatic circuits, pneumatic schematics, the principles of pneumatic pressure and flow, and pneumatic speed control circuits. It covers pressure regulation, air filtration, how to connect pneumatic circuits, pneumatic cylinders, valves, and actuators, a wide array of pneumatic applications, pressure and cylinder force, pneumatic leverage, pressure and volume, and air flow resistance.

1. Pneumatic Power Systems
2. Basic Pneumatic Circuits
3. Principles of Pneumatic Pressure and Flow
4. Pneumatic Speed Control

Intermediate Pneumatics

Intermediate pneumatics builds on the basic pneumatics skills to teach intermediate pneumatic components and system applications. Learners will gain industry-relevant skills related to these new topics including operation, installation, performance analysis, maintenance, and design. These topics include cam-operated valves, cylinder sequencing with cam valves, cylinder deceleration circuits, pilot operated DCVs, shuttle valves, air logic components, air logic design, air filters, filter selection, filter maintenance, water removal techniques, air dryers, after-coolers, water traps, air lubricators, and component maintenance.

1. Pneumatic DCV Applications
2. Air Logic
3. Pneumatic Maintenance

Advanced Pneumatics

Advanced Pneumatics adds to the basic and intermediate pneumatic skills teaching advanced pneumatic applications. Students will learn industry-relevant skills related to these new topics including operation, installation, performance analysis, maintenance, and design. These topics include advanced pneumatic principles, pneumatic cylinder loads, cylinder applications, quick exhaust valves, motor loads, air bearings, component sizing, air compressor types, air compressor operation, flow measurement, compressor performance, air filtration, lubricators, water removal, dryers, and pneumatic component maintenance.

1. Moving Loads Pneumatically
2. Vaccuum Systems
3. Air Compressors

Pneumatic Troubleshooting

Teaches pneumatic troubleshooting.

1. Introduction to Pneumatic Troubleshooting
2. Air Reparation Troubleshooting
3. Troubleshooting Pneumatic Cylinders
4. Motor and Rotary Actuator Troubleshooting
5. Troubleshooting DCV and Flow Control Valves
6. Troubleshooting Vacuum Systems
7. Troubleshooting Pneumatic Systems

Plastics Technology Certificate

18 hours | Theory/Hands-on

Plastics Technology provides an introduction to injection molding operations that covers the injection molding process, material and machine safety, molding operations, and molding problems and solutions. This program includes teaching inserts, threads and multiple part molds, integral hinge, and system purging. It continues into more advanced topics such as chemistry and properties of plastics, blow molding operations, and extrusion process, safety, and operations. The program also incorporates introduction to plastics technology through molding and continues into blow molding and extrusion operations.

1. Introduction to Injection Molding Operations
2. Injection Molding Operations
3. Plastics: Chemistry and Properties
4. Introduction to Blow Molding Operations
5. Introduction to Extrusion Operations

Mechanical Certificate 1

63 Hours | Theory/Hands-on

Mechanical Drives 1

This course provides a comprehensive understanding of how to operate, install, and analyze mechanical drives and how they are used in real-world applications. Learners will study topics like: the function and construction of a bedplate; four types of shaft material; the operation of a fractional HP V-belt drive; how to determine allowable chain sag for a given application; and methods of measuring spur gear backlash.

1. Introduction to Mechanical Drive Systems
2. Key Fasteners
3. Power Transmission Systems
4. Introduction to V-Belt Drives
5. Introduction to Chain Drives
6. Spur Gear Drives
7. Multiple Shaft Drives

Mechanical Drives 2

Mechanical Drives 2 covers heavy duty V-Belt drives including conventional, multiple, wedge, and variable speed V-Belt drives. This course describes V-Belt selection and maintenance by covering V-Belt size specification, component identification, and troubleshooting. Learners will develop fundamental knowledge of synchronous belt drives, lubrication concepts, precision shaft alignment, and coupling. Also covered is heavy duty chain drives which describes silent chain drives, multiple-strand systems, chain selection, chain lubrication, chain maintenance and troubleshooting.

1. Heavy-Duty V-Belt Drives
2. V-Belt Selection and Maintenance
3. Synchronous Belt Drives
4. Lubrication Concepts
5. Precision Shaft Alignment
6. Couplings
7. Heavy-Duty Chain Drives

Mechanical Drives 3

Mechanical Drives 3 includes describing lubrication, selection, maintenance, and troubleshooting of plain ball bearings. It introduces anti-friction bearings by describing two types of bearing and teaching the fundamental skills of how to identify, mechanically install, thermally install, and troubleshoot those bearings. Also covered is gasket and seals (such as O-ring seal, lip seal, and mechanical seal), advance gear drives (such as helical gear drives, right angle gear drives, and speed reducers), gear drive selection, and maintenance.

1. Plain Bearings
2. Ball Bearings
3. Roller Bearings
4. Antifriction Bearings Selection and Maintenance
5. Gaskets and Seals
6. Advanced Gear Drives
7. Gear Drive Selection and Maintenance

Process Control Certificate

67 Hours | Theory/Hands-on

Pump Systems

The Pumps Systems curriculum teaches skills related to centrifugal pumps, which are used in aost every industry to transfer non-hydraulic fluids of various types from one place to another. Students learn 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.

1. Centrifugal Pump Operations
2. Centrifugal Pump Characteristics
3. Centrifugal Pump Troubleshooting
4. System Characteristics
5. Centrifugal Pump Performance
6. Multiple Pump Operation

Process Control Systems

Level and Flow Process Control teaches two of the most common types of process control systems, flow and liquid level. This course covers process control safety, instrument tags, piping and instrumentation diagrams, and level measurement, then moves into system control functions such as liquid level control, automatic control methods, basic flow measurement and control, and control loop performance.

1. Introduction to Process Control
2. Instrument Tags
3. Piping and Instrumentation Diagrams
4. Loop Controllers
5. Final Control Elements
6. Level Measurements
7. Liquid Level Control
8. Methods of Automatic Control
9. Basic Flow Measurement and Control
10. Control Loop Performance
11. Ultrasonic Level Measurement and Control
12. Differential Pressure Flow Measurement and Control

Thermal Process Control System

Process control systems provide precise control of liquids and gases in a wide variety of industrial applications including food processing, chemical manufacturing, and bio-technology. The Temperature Process Control eBook teaches one of the most common types of process control systems, temperature control. Students will learn to calibrate, adjust, install, operate, and tune thermal process control systems in industrial applications.

1. Thermal Energy
2. Basic Temperature Control Elements
3. Temperature Sensors
4. Temperature Transmitters
5. Basic Temperature Control

Instrumentation Certificate

72 Hours | Theory/Hands-on

PLC Troubleshooting System
Allen-Bradley ControlLogix 5500

This course will teach how to design, program and operate a PLC to control a number of process applications used by industries all over the world. The skills learned are in high demand everywhere today. These skills include orientation, operation, programming, memory organization, program analysis, motor control, discrete I/O interfacing, troubleshooting, systems troubleshooting, event sequencing, application development timer instructions, counter instructions, program control instructions, and math and data move instructions.

1. Introduction to Programmable Controllers
2. Basic PLC Programming
3. PLC Motor Control
4. Discrete I/O Interfacing
5. Introduction to PLC Troubleshooting
6. PLC Systems Troubleshooting
7. Event Sequencing
8. Application Development
9. PLC Timer Instructions
10. PLC Counter Instructions
11. Program Control Instructions
12. Math and Data Move Instructions

Process Control Systems

Process control systems provide precise control of liquids and gases in a wide variety of industrial applications including food processing, chemical manufacturing, and bio-technology. The Temperature Process Control eBook teaches one of the most common types of process control systems, temperature control. Students will learn to calibrate, adjust, install, operate, and tune thermal process control systems in industrial applications.

1. Introduction to Process Control
2. Instrument Tags
3. Piping and Instrumentation Diagrams
4. Loop Controllers
5. Final Control Elements
6. Level Measurements
7. Liquid Level Control
8. Methods of Automatic Control
9. Basic Flow Measurement and Control
10. Control Loop Performance
11. Ultrasonic Level Measurement and Control
12. Differential Pressure Flow Measurement and Control

ControlLogix Process Control

This PLC-based process control course covers topics such as on/off, open loop, closed-loop, PID control of level and temperature, analog module configuration, and loop tuning. These topics are important to anyone currently working in or interested in the field of PLC automation or process control.

1. On/Off and Open Loop Operation
2. Closed Loop Control

Multicraft Technician Certificate

96 Hours | Theory/Hands-on

AC/DC Electrical Systems

1. Basic Electrical Circuits
2. Electrical Measurements
3. Circuit Analysis
4. Induction and Capacitance
5. Combination Circuits
6. Transformers

Basic Pneumatics

1. Pneumatic Power Systems
2. Basic Pneumatic Circuits
3. Principles of Pneumatic Pressure and Flow
4. Pneumatic Speed Control
5. Introduction to Electronics Sensors

Electric Motor Control

1. Introduction to Electric Motor Control
2. Manual Motor Control and Overload Protection
3. Control Transformers
4. Control Ladder Logic
5. Control Relays and Motor Starters
6. Introduction to Troubleshooting
7. Systems Troubleshooting
8. Reversing Motor Control
9. Automatic Input Devices
10. Basic Timer Control: On-Delay and Off-Delay

Mechanical Drive Systems 1

1. Introduction to Mechanical Drives Systems
2. Key Fasteners
3. Power Transmission Systems
4. Introduction to V-Belt Drives
5. Introduction to Chain Drives
6. Spur Gear Drives
7. Multiple Shaft Drives

Introduction to Welding and Welding Concepts

1. Welding Safety Essentials
1. PPE for Welding
2. Introduction to Welding
3. Introduction to GMAW
4. Introduction to SMAW
5. Introduction to GTAW

Maintainer/Operator Certificate

30 Hours | Theory/Hands-on

The Operator/Maintainer certificate program at Columbus State Community College provides entry level electro-mechanical training. The training builds a comprehensive foundation in basic understanding of electrical, mechanical, and hydraulic systems. Upon completion of the program, students will have knowledge in topics including basic measurements, Lockout/Tag out, 3 phase power, and electric motor installation. The program will expedite training time, reduce workplace accidents, and enhance employee productivity.

Safety

1. Personal Protective Equipment
2. Safety Practices and Regulations
3. Lockout/Tag Out

Measurement & Gauging

1. Basic Measurement
2. Precision Measurement Tools

Mechanical Drive Systems

1. Introduction to Mechanical Drives Systems
2. Key Fasteners

Basic Pneumatics

1. Pneumatic Power Systems
2. Basic Pneumatic Circuits

AC/DC Elecrical Systems

1. Basic Electrical Circuits
2. Electrical Measurements

Electric Motor Control

1. Introduction to Electric Motor Control
2. Manual Motor Control and Overload Protection

21st Century Job Skills

1. Leadership
2. Teaming
3. Communications
4. Problem Solving

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