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Control Systems Technician Associate Degree

Program Example

Setting the Standard for Automation™

Control Systems Technician Associate Degree

ISA, working with industry experts and academicians, developed guidelines for a control systems technician associate degree program. These guidelines are designed to serve as a possible resource for educational institutions that offer an associate degree program for control systems technicians or a similar technology program. ISA recognizes that associate degree program requirements will vary depending on region and local industry needs.

The model curriculum suggested here will be of particular interest to educators who wish to prepare their students to take ISA's Control Systems Technician (CST) Associate exam. The CST Associate program is a recognition program for students who pass the CST Associate exam. This exam covers fundamental knowledge of calibration, loop checking, troubleshooting, and start-up and is based on the ISA Certified Control Systems Technician® (CCST®) fundamental knowledge and skills. On the back page of this brochure, you will find an example of how the key CCST Level 1 tasks could be mapped to the courses suggested in the model curriculum.

For more information about the CST Associate Program, visit **www.isa.org/cert/cst**.

General Course Requirement for the Associate Degree
ISA recommends the following minimum instructional requirements for the two year technology program for students preparing to become a control systems technician. These requirements are consistent with the requirements for accreditation by the Accreditation Board for Engineering and Technology (ABET).

Total Credits: Associate degree programs must consist of a minimum of 64 semester hours or 96 quarter hours of credit.

Communications: The communications content must develop the ability of graduates to:

a. plan, organize, prepare, and deliver effective technical reports in written, oral, and other formats appropriate to the discipline and goals of the program,

b. incorporate communications skills throughout the technical content of the program,

c. utilize the appropriate technical literature and use it as a principal means of staying current in their chosen technology, and

d. utilize the interpersonal skills required to work effectively in teams.

Mathematics: The level and focus of the mathematics content must provide students with the skills to solve technical problems appropriate to the discipline and the program objectives. Algebra, trigonometry, and an introduction to mathematics above the level of algebra and trigonometry constitute the foundation mathematics for an associate degree program. Integral and differential calculus, or other appropriate mathematics above the level of algebra and trigonometry, constitutes the foundation mathematics for baccalaureate programs.

Physical and Natural Science: The basic science content can include physics, chemistry, or life and earth sciences that support program objectives. This component must include laboratory experiences which develop expertise in experimentation, observation, measurement and documentation.

Social Sciences and Humanities: The social sciences and humanities content must support technical education by broadening student perspective and imparting an understanding of diversity and the global and societal impacts of technology.

Technical Content: The technical content of a program must focus on the applied aspects of science and engineering in that portion of the technological spectrum closest to product improvement, manufacturing, construction and engineering operational functions. The technical content must develop the skills, knowledge, methods, procedures, and techniques associated with the technical discipline and appropriate to the goals of the program.

The technical content develops the depth of technical specialty and must represent at least 1/3 of the total credit hours for the program. In order to accommodate the essential mathematics, sciences, communications, and humanities components, the technical content is limited to no more than 2/3 the total credit hours for the program.

a. The technical content of the curriculum consists of a technical core and the increasingly complex technical specialties found later in the curriculum. The technical core must provide the prerequisite foundation of knowledge necessary for the technical specialties.

b. Laboratory activities must develop student competence in the use of analytical and measurement equipment common to the discipline and appropriate to the goals of the program.

c. Technical courses must develop student knowledge and competence in the use of standard design practices, tools, techniques, and computer hardware and software appropriate to the discipline and goals of the program.

d. Capstone or other integrating experiences must draw together diverse elements of the curriculum and develop student competence in focusing both technical and nontechnical skills in solving problems.

Cooperative Education: Cooperative education credit used to satisfy prescribed elements of these criteria must include an appropriate academic component evaluated by the program faculty.

Control Systems Technician Associate Degree Program
Model Curriculum

Freshman Year		Sophomore Year	
Fall Semester	**Semester Hours**	**Fall Semester**	**Semester Hours**
Algebra	3	Chemistry w/Laboratory	4
DC Theory	3	Network Communications	3
Composition I	3	Control Systems I	3
Social Science	3	Industrial Measurement	3
Introduction to I&C Technology	3	Technical Communications	3
		Technical Elective	2
TOTAL HOURS	**15**	**TOTAL HOURS**	**18**
Spring Semester		**Spring Semester**	
Trigonometry	3	Control Systems II	3
AC Theory	3	Advanced Measurement	4
Technical Writing	3	Advanced Digital Applications	3
Intro to Computer Science	3	Technical Elective	2
Physics w/Lab	4	Humanities	3
TOTAL HOURS	**16**	**TOTAL HOURS**	**15**
Total Number of Semester Hours	**64**		
Elective Courses			
Calculus	3		
Industrial Co-op/Internship	4		
National Electrical Code	3		
Advanced PLCs	3		
Motor Control/Drives	3		
Fluid Power	3		
Process Analytical Technology	3		

Control Systems Technician (CST) Associate Program

The ISA CST Associate Program is a recognition program for students who demonstrate their commitment to a career in automation and control. The exam is typically given in the last semester of an associate degree program.

A CST Associate meets specific criteria based on educational courses or work experience in automation and control, electrical, electronics, or mechanical technologies at the time of submitting an application.

One of the following backgrounds will satisfy the requirement:

1. Successfully completed 16 semester course hours or 24 quarter hours from an educational institution within the related technology areas. Courses in basic science, mathematics, social science, humanities, and communications will not count toward the requirement.
2. Completed two year academic degree in related technology area. Related technology areas include instrumentation, measurement and control, electrical, electronics, or mechanical technologies. Computer programming courses related to practical engineering applications will qualify.

For questions, contact ISA at
info@isa.org or (919) 549-8411.

For information on ISA's Control Systems Technician (CST) Associate Program, visit **www.isa.org/cert/cst**

Courses Mapped to Certified Control Systems Technician® (CCST®) Program

Domain I: Calibration	Introduction to I&C Technology	DC Theory	AC Theory	Intro to Computer Science	Network Comm	Control Systems I	Control Systems II	Industrial Measurement	Advanced Measurement	Advanced Digital Applications
1. Obtain all documents, including historical documentation, needed for device calibration in order to proceed with calibration.	X			X		X		X		
2. Identify the correct device to be calibrated through documentation and instrument identification systems in order to ensure proper calibration.		X	X					X		X
3. Select the correct test equipment through documentation and visual inspection as identified by site calibration procedures in order to correctly calibrate the device.	X	X	X		X	X			X	X
4. Connect the test equipment to the device as required by manufacturer specifications and site procedures in order to properly and safely calibrate the device.	X	X	X		X				X	X
5. Apply input values to the device as specified on instrument data sheet in order to simulate process parameters.		X	X		X				X	X
6. Record "as found" readings on calibration sheets in order to provide a history of the device.		X	X	X					X	X
7. Compare "as found" readings with the required values as specified by the instrument data sheet in order to identify if the device needs to be adjusted according to allowable tolerances.		X	X	X					X	
8. Make adjustments to the device, if necessary, through site calibration procedures in order to ensure accuracy.		X	X			X			X	X
9. Complete all documentation as required in order to update all calibration records.	X	X	X	X				X		X

Domain II: Loop Checking	Introduction to I&C Technology	DC Theory	AC Theory	Intro to Computer Science	Network Comm	Control Systems I	Control Systems II	Industrial Measurement	Advanced Measurement	Advanced Digital Applications
1. Obtain documents, including historical documentation, pertaining to the process loop in order to understand all devices and the processes and their intended functions.		X	X			X		X		X
2. Inspect the loop components through visual observation in order to ensure that the components are correctly installed.		X	X		X	X		X		X
3. Verify that appropriate utilities are available and operational through visual inspection in order to perform the loop check.		X	X			X		X		X
4. Isolate the process loop from the control system by following established site procedures in order to perform the loop check in a safe manner.							X		X	X
5. Simulate a change in the measured variable in order to verify proper loop performance.	X	X	X			X			X	X
6. Make necessary corrections in order to bring loop performance within specifications.		X	X			X			X	X
7. Complete all documentation as required in order to update all loop records.		X	X	X	X			X		

Domain III: Troubleshooting	Introduction to I&C Technology	DC Theory	AC Theory	Intro to Computer Science	Network Comm	Control Systems I	Control Systems II	Industrial Measurement	Advanced Measurement	Advanced Digital Applications
1. Examine all pertinent documentation, including historical documentation, in order to identify the proper operation of the control system and devices and to provide a baseline against which to evaluate the problem.	X			X	X		X	X		X
2. Identify any discrepancies between observed and proper operation of the control system in order to determine whether a problem exists.	X	X	X	X			X	X		X
3. Determine which device or devices of the control system could be causing the observed discrepancies in order to formulate a plan of corrective action.	X	X	X	X	X		X		X	X
4. Isolate each suspected device from the control system by following established site procedures in order to perform troubleshooting in a safe manner.	X			X	X		X		X	X
5. Exercise each device across calibrated range in order to determine proper operation.	X	X	X			X			X	X
6. Perform corrective action, if necessary, according to site procedures in order to resolve the problem.	X	X	X		X		X		X	X
7. Complete all documentation as required in order to update all records.				X				X		X

Domain IV: Start-Up	Introduction to I&C Technology	DC Theory	AC Theory	Intro to Computer Science	Network Comm	Control Systems I	Control Systems II	Industrial Measurement	Advanced Measurement	Advanced Digital Applications
1. Examine all pertinent documentation in order to verify completion of all control systems that are required for start-up.	X			X		X		X		
2. Implement applicable safety practices to be followed in order to ensure that all personnel are informed of the possible hazards during start-up.	X			X	X	X			X	X
3. Coordinate activities with all personnel involved in order to ensure that all personnel are aware of their responsibilities during start-up.		X	X	X					X	
4. Implement start-up according to site procedures in order to ensure that the system is operating properly.				X	X		X		X	X
5. Assist site personnel to identify and correct problems that arise during start-up in order to commission the system.		X	X	X	X		X		X	X
6. Complete all documentation as required in order to update all records.				X				X		X

For information on CCST, visit **www.isa.org/ccst**