

## Curriculum Standard for Industrial Systems Technology

**Career Cluster:** Manufacturing\*\*

**Cluster Description:** Planning, managing and performing the processing of materials into intermediate or final products and related professional and technical support activities such as production planning and control, maintenance and manufacturing/process engineering.

**Pathway:** Maintenance, Installation,  
and Repair

**Effective Term:** Fall 2022 (2022\*03)

### Program Majors Under Pathway

**Program Major / Classification of Instruction Programs (CIP)  
Code**

**Credential Level(s) Offered**

**Program Major  
Code**

Industrial Systems Technology

CIP Code 15.0499

AAS/Diploma/Certificate

A50240

### Pathway Description:

The Industrial Systems Technology curriculum is designed to prepare or upgrade individuals to safely service, maintain, repair, or install equipment. Instruction includes theory and skill training needed for inspecting, testing, troubleshooting, and diagnosing industrial systems.

Students will learn multi-craft technical skills in print reading, mechanical systems maintenance, electricity, hydraulics/pneumatics, welding, machining or fabrication, and includes various diagnostic and repair procedures. Practical application in these industrial systems will be emphasized and additional advanced course work may be offered.

Upon completion of this curriculum, graduates should be able to individually, or with a team, safely install, inspect, diagnose, repair, and maintain industrial process and support equipment. Students will also be encouraged to develop their skills as life-long learners.

*Program Description: Choose one of the following 4<sup>th</sup> paragraphs to use in conjunction with the first three paragraphs of the pathway description above for documentation used to identify each **Program Major**:*

**N/A**

\*Within the degree program, the institution shall include opportunities for the achievement of competence in reading, writing, oral communication, fundamental mathematical skills, and basic use of computers.

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**I. General Education Academic Core**

[Curriculum Requirements for associate degree, diploma, and certificate programs in accordance with 1D SBCCC 400.10]: Degree programs must contain a minimum of 15 semester hours including at least one course from each of the following areas: humanities/fine arts, social/behavioral sciences, and natural sciences/mathematics. Degree programs must contain a minimum of 6 semester hours of communications. Diploma programs must contain a minimum of 6 semester hours of general education; 3 semester hours must be in communications. General education is optional in certificate programs.

**Industrial Systems Technology**

| <b>Recommended General Education Academic Core</b>  | <b>AAS</b>    | <b>Diploma</b> | <b>Certificate</b> |
|---|---------------|----------------|--------------------|
| <b>Minimum General Education Hours Required:</b>  | <b>15 SHC</b> | <b>6 SHC</b>   | <b>0 SHC</b>       |
| <p><i>Courses listed below are recommended general education courses for this curriculum standard. Colleges may choose to include additional or alternative general education courses to meet local curriculum needs.</i></p> <p><i>*Recommended certificate and diploma level curriculum courses. These courses may <u>not</u> be included in associate degree programs.</i></p> <p><b>Communication:</b></p> <ul style="list-style-type: none"> <li>* COM 101 Workplace Communication 3 SHC</li> <li>COM 110 Introduction to Communications 3 SHC</li> <li>COM 120 Intro Interpersonal Com 3 SHC</li> <li>COM 231 Public Speaking 3 SHC</li> <li>* ENG 101 Applied Communications I 3 SHC</li> <li>* ENG 102 Applied Communications II 3 SHC</li> <li>ENG 110 Freshman Composition 3 SHC</li> <li>ENG 111 Expository Writing 3 SHC</li> <li>ENG 114 Prof Research &amp; Reporting 3 SHC</li> <li>ENG 116 Technical Report Writing 3 SHC</li> </ul> <p><b>Humanities/Fine Arts:</b></p> <ul style="list-style-type: none"> <li>* HUM 101 Values in the Workplace 2 SHC</li> <li>HUM 110 Technology and Society 3 SHC</li> <li>HUM 115 Critical Thinking 3 SHC</li> <li>HUM 230 Leadership Development 3 SHC</li> <li>PHI 230 Introduction to Logic 3 SHC</li> <li>PHI 240 Introduction to Ethics 3 SHC</li> </ul> <p><b>Social /Behavioral Sciences:</b></p> <ul style="list-style-type: none"> <li>ECO 151 Survey of Economics 3 SHC</li> <li>ECO 251 Prin of Microeconomics 3 SHC</li> <li>* PSY 101 Applied Psychology 3 SHC</li> <li>* PSY 102 Human Relations 2 SHC</li> <li>PSY 118 Interpersonal Psychology 3 SHC</li> <li>PSY 135 Group Processes 3 SHC</li> <li>PSY 150 General Psychology 3 SHC</li> <li>* SOC 105 Social Relationships 3 SHC</li> <li>SOC 210 Introduction to Sociology 3 SHC</li> <li>SOC 215 Group Processes 3 SHC</li> </ul> <p><b>Natural Sciences/Mathematics:</b></p> <ul style="list-style-type: none"> <li>MAT 110 Math Measurement &amp; Literacy 3 SHC</li> <li>MAT 121 Algebra/Trigonometry I 3 SHC</li> <li>MAT 143 Quantitative Literacy 3 SHC</li> <li>MAT 152 Statistical Methods I 4 SHC</li> <li>MAT 171 Precalculus Algebra 4 SHC</li> <li>MAT 223 Applied Calculus 3 SHC</li> <li>MAT 271 Calculus I 4 SHC</li> <li>PHY 110 Conceptual Physics 3 SHC</li> <li>PHY 121 Applied Physics I 4 SHC</li> </ul> | <b>6 SHC</b>  | <b>3-6 SHC</b> | <b>Optional</b>    |
|   | <b>3 SHC</b>  | <b>0-3 SHC</b> | <b>Optional</b>    |
|   | <b>3 SHC</b>  | <b>0-3 SHC</b> | <b>Optional</b>    |
|   | <b>3 SHC</b>  | <b>0-3 SHC</b> | <b>Optional</b>    |

**II. Major Hours.** AAS, diploma, and certificate programs must include courses which offer specific job knowledge and skills. Work-based learning may be included in associate in applied science degrees up to a maximum of 8 semester hours of credit; in diploma programs up to a maximum of 4 semester hours of credit; and in certificate programs up to a maximum of 2 semester hours of credit. Below is a description of each section under Major Hours.

- A. Technical Core.** The technical core is comprised of specific courses which are required for all Program Majors under this Curriculum Standard. A diploma program offered under an approved AAS program standard or a certificate which is the highest credential level awarded under an approved AAS program standard must include a minimum of 12 semester hours credit derived from the curriculum core courses or core subject area of the AAS program.
- B. Program Major(s).** The Program Major must include a minimum of 12 semester hours credit from required subjects and/or courses. The Program Major is in addition to the technical core.
- C. Other Major Hours.** Other major hours must be selected from prefixes listed on the curriculum standard. A maximum of 9 semester hours of credit may be selected from each prefix listed, with the exception of prefixes listed in the core.

| <b><i>Industrial Systems Technology (A50240)</i></b>   | <b>AAS</b>       | <b>Diploma</b>    | <b>Certificate</b> |
|--|------------------|-------------------|--------------------|
| <b>Minimum Major Hours Required:</b>   | <b>49 SHC</b>    | <b>30 SHC</b>     | <b>12 SHC</b>      |
| <b>A. Technical Core:</b><br><i>Courses required for the diploma are designated with *</i> <ul style="list-style-type: none"> <li>* HYD 110    Hydraulics/Pneumatics I            3 SHC</li> <li>* <b>Electricity. Select One:</b> <ul style="list-style-type: none"> <li>ELC 111    Intro to Electricity                            3 SHC</li> <li>ELC 112    DC/AC Electricity                            5 SHC</li> <li>ELC 131    Circuit Analysis I                            4 SHC</li> </ul> </li> <li>* <b>Maintenance/Mechanisms. Select One:</b> <ul style="list-style-type: none"> <li>MNT 110    Intro to Maint Procedures                2 SHC</li> <li>MEC 130    Mechanisms                                    3 SHC</li> </ul> </li> <li>* <b>Prints and Diagrams. Select One:</b> <ul style="list-style-type: none"> <li>BPR 111    Print Reading                                2 SHC</li> <li>BPR 115    Elc/Fluid Power Diagrams                2 SHC</li> <li>BPR 135    Schematics &amp; Diagrams                    2 SHC</li> <li>ELC 125    Diagrams and Schematics                2 SHC</li> </ul> </li> <li>* <b>Metalworking and Fabrication. Select One:</b> <ul style="list-style-type: none"> <li>MAC 111    Machining Technology I                    6 SHC</li> <li>MAC 141    Machining Applications I                4 SHC</li> <li>MEC 111    Machine Processes I                        3 SHC</li> <li>MNT 131    Metalworking Processes                 3 SHC</li> <li>MNT 160    Industrial Fabrication                     2 SHC</li> </ul> </li> <li>* <b>Safety. Select One:</b> <ul style="list-style-type: none"> <li>ISC 110    Workplace Safety                          1 SHC</li> <li>ISC 112    Industrial Safety                            2 SHC</li> <li>ISC 121    Envir Health &amp; Safety                      3 SHC</li> </ul> </li> <li>* <b>Welding. Select One:</b> <ul style="list-style-type: none"> <li>WLD 112    Basic Welding Processes                 2 SHC</li> <li>WLD 115    SMAW (Stick) Plate                        5 SHC</li> <li>WLD 121    GMAW (MIG) FCAW/Plate                 4 SHC</li> <li>WLD 131    GTAW (TIG) Plate                         4 SHC</li> </ul> </li> </ul> | <b>27-35 SHC</b> | <b>15- 27 SHC</b> |                    |

**Required Subject Areas: Select one.**

*For AAS degree, select one subject area plus additional courses from the prefixes listing within the same subject area for a minimum of (12) semester hours of credit:*

**Industrial Systems.**

Select 12 SHC from prefixes listed in the technical core.

**Biofuels Production.**

|     |     |                    |       |
|-----|-----|--------------------|-------|
| ALT | 110 | Biofuels I         | 3 SHC |
| ALT | 210 | Biofuels II        | 4 SHC |
| ALT | 211 | Biofuels Analytics | 4 SHC |

**Electrical Power Production.**

|     |     |                           |       |
|-----|-----|---------------------------|-------|
| EPP | 110 | Intro to Power Plant Oper | 2 SHC |
| EPP | 112 | Fuels and Combustion      | 3 SHC |
| EPP | 210 | Power Plant Systems       | 3 SHC |
| EPP | 212 | Steam & Combustion TG     | 3 SHC |
| EPP | 214 | Power Plant Environ Mgt   | 2 SHC |

**Biogas Systems.**

|     |     |                        |       |            |
|-----|-----|------------------------|-------|------------|
| ISC | 255 | Engineering Economy    | 3 SHC |            |
| WAT | 161 | Solid Waste Management | 2 SHC |            |
| WLD | 145 | Thermoplastic Welding  | 2 SHC |            |
| ALT | 130 | Biogas Operations      | 2 SHC | <i>and</i> |
| WBL | 111 | Work-Based Learning I  | 1 SHC |            |
| ALT | 131 | Biogas Processes       | 2 SHC | <i>and</i> |
| WBL | 121 | Work-Based Learning II | 1 SHC |            |

**B. Program Major(s): Not Applicable**

**C. Other Major Hours: To be selected from the following prefixes:**

AHR, ALT, ATR, BPM, BPR, CIS, CMT, CSC, CTC, DFT, EGR, ELC, ELN, EPP, HET, HYD, ISC, MAC, MAT, MEC, MNT, NET, NUC, OMT, PCI, PFT, PHS, PHY, PKG, PLU, PPT, PTC, REF, SST, WAT, WBL, WLD, and WOL

*Up to two semester hour credits may be selected from ACA.*

*Three semester hour credits may be selected from PTE.*

*Up to three semester hour credits may be selected from the following prefixes: ARA, ASL, CHI, FRE, GER, IRI, ITA, JPN, LAT, POR, RUS and SPA*

**III. Other Required Hours**

*A college may include courses to meet graduation or local employer requirements in a certificate (0-1 SHC), diploma (0-4 SHC), or an associate in applied science (0-7 SHC) program. These curriculum courses shall be selected from the Combined Course Library and must be approved by the System Office prior to implementation. Restricted, unique, or free elective courses may not be included as other required hours.*

#### IV. Employability Competencies

Fundamental competencies that address soft skills vital to employability, personal, and professional success are listed below. Colleges are encouraged to integrate these competencies into the curriculum by embedding appropriate student learning outcomes into one or more courses or through alternative methods.

- A. Interpersonal Skills and Teamwork** – The ability to work effectively with others, especially to analyze situations, establish priorities, and apply resources for solving problems or accomplishing tasks.
- B. Communication** – The ability to effectively exchange ideas and information with others through oral, written, or visual means.
- C. Integrity and Professionalism** – Workplace behaviors that relate to ethical standards, honesty, fairness, respect, responsibility, self-control, criticism and demeanor.
- D. Problem-solving** – The ability to identify problems and potential causes while developing and implementing practical action plans for solutions.
- E. Initiative and Dependability** – Workplace behaviors that relate to seeking out new responsibilities, establishing and meeting goals, completing tasks, following directions, complying with rules, and consistent reliability.
- F. Information processing** – The ability to acquire, evaluate, organize, manage, and interpret information.
- G. Adaptability and Lifelong Learning** – The ability to learn and apply new knowledge and skills and adapt to changing technologies, methods, processes, work environments, organizational structures and management practices.
- H. Entrepreneurship** – The knowledge and skills necessary to create opportunities and develop as an employee or self-employed business owner.

*\*An **Employability Skills Resource Toolkit** has been developed by NC-NET for the competencies listed above.*

*Additional information is located at: <http://www.nc-net.info/employability.php>*

*\*\*The North Carolina Career Clusters Guide was developed by the North Carolina Department of Public Instruction and the North Carolina Community College system to link the academic and Career and Technical Education programs at the secondary and postsecondary levels to increase student achievement. Additional information about Career Clusters is located at: [http://www.nc-net.info/NC\\_career\\_clusters\\_guide.php](http://www.nc-net.info/NC_career_clusters_guide.php) or <http://www.careertech.org>.*

*Summary of Required Semester Hour Credits (SHC) for each credential:*

|  | <b>AAS</b>   | <b>Diploma</b> | <b>Certificate</b> |
|--|--------------|----------------|--------------------|
| Minimum General Education Hours          | 15           | 6              | 0                  |
| Minimum Major Hours                      | 49           | 30             | 12                 |
| Other Required Hours                     | 0-7          | 0-4            | 0-1                |
| <b>Total Semester Hours Credit (SHC)</b> | <b>64-76</b> | <b>36-48</b>   | <b>12-18</b>       |

*\*Within the degree program, the institution shall include opportunities for the achievement of competence in reading, writing, oral communication, fundamental mathematical skills, and basic use of computers.*

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