Revised–June 2024

Manufacturing Career Cluster

The Manufacturing career cluster focuses on 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 process engineering. This career cluster includes occupations ranging from welder and machinist to industrial engineering technician and semi-conductor processing technician.

Statewide Program of Study: Robotics and Automation Technology

The Robotics and Automation Technology program of study focuses on occupational and educational opportunities associated with the assembly, operation, maintenance, and repair of electromechanical equipment or devices. This program of study includes exploration of a variety of mechanical fields, including robotics, refinery and pipeline systems, deep ocean exploration, and hazardous waste removal.

Secondary Courses for High School Credit

Level 1	• Principles of Manufacturing • Principles of Applied Engineering
Level 2	• Robotics I • Manufacturing Engineering Technology I • Programmable Logic Controller I
Level 3	• Robotics II • Manufacturing Engineering Technology II • Engineering Design and Presentation I
Level 4	• Practicum in Manufacturing

Aligned Advanced Academic Courses

Dual Credit	Dual credit offerings will vary by local education agency.

Students should be advised to consider these course opportunities to enrich their preparation. AP or IB courses not listed under the Secondary Courses for High School Credit section of this framework document do not count towards concentrator/completer status for this program of study.

Work-Based Learning and Expanded Learning Opportunities

Work-Based Learning Activities	• Intern with a robotics technician working at a manufacturing plant • Shadow a PLC programmer
Expanded Learning Opportunities	• Tour a manufacturing facility • Participate in SkillsUSA or TSA • Build a robot and participate in a robotics competition

Aligned Industry-Based Certifications

- C-101 Certified Industry 4.0 Associate - Basic Operations
- FESTO Certified Industry 4.0 Associate Fundamentals

Example Postsecondary Opportunities

Associate Degrees
- Instrumentation Technology
- Industrial Technology
- Robotics Technology
- Automation Engineer Technology

Bachelor's Degrees
- Mechanical Engineering
- Electrical Electronics Engineering
- Electrical, Electronic, and Communications Engineering Technology
- Electromechanical Engineering Technology

Master's, Doctoral, and Professional Degrees
- Mechanical Engineering
- Engineering/Industrial Management
- Industrial Engineering
- Electrical and Electronics Engineering

Example Aligned Occupations

Computer Numerically Controlled Tool Operators
Median Wage: $46,353
Annual Openings: 1,146
10-Year Growth: 10%

Semiconductor Processing Technicians
Median Wage: $36,902
Annual Openings: 621
10-Year Growth: 9%

Industrial Engineers
Median Wage: $100,000
Annual Openings: 1,898
10-Year Growth: 26%

Data Source: TexasWages, Texas Workforce Commission. Retrieved 3/8/2024.

For more information visit: https://tea.texas.gov/academics/college-career-and-military-prep/career-and-technical-education/programs-of-study-additional-resources

Successful completion of the Robotics and Automation Technology program of study will fulfill requirements of the Business and Industry Endorsement or the STEM endorsement if the math and science requirements are met.

Texas Education Agency

Revised–June 2024

Manufacturing Career Cluster

The Manufacturing career cluster focuses on 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 process engineering. This career cluster includes occupations ranging from welder and machinist to industrial engineering technician and semi-conductor processing technician.

Statewide Program of Study: Manufacturing Technology

The Manufacturing Technology program of study focuses on occupational and educational opportunities associated with the development and use of automatic and computer-controlled machines, tools, and robots that perform work on metal or plastic. It includes exploration of a variety of machine tools that are used to produce precision parts and instruments. This program of study addresses how to modify parts to make or repair machine tools or maintain individual machines, and how to use hand-welding or flame-cutting equipment.

Secondary Courses for High School Credit

Level 1	• Principles of Manufacturing • Principles of Applied Engineering
Level 2	• Diversified Manufacturing I • Metal Fabrication and Machining I
Level 3	• Diversified Manufacturing II • Metal Fabrication and Machining II • Precision Metal Manufacturing I
Level 4	• Precision Metal Manufacturing II • Practicum in Manufacturing

Aligned Advanced Academic Courses

Dual Credit	Dual credit offerings will vary by local education agency.

Students should be advised to consider these course opportunities to enrich their preparation. AP or IB courses not listed under the Secondary Courses for High School Credit section of this framework document do not count towards concentrator/completer status for this program of study.

Work-Based Learning and Expanded Learning Opportunities

Work-Based Learning Activities	• Shadow a metallurgist working at a refinery, steel mill, or aircraft manufacturing company • Intern at a manufacturing plant using CNC machines
Expanded Learning Opportunities	• Tour a manufacturing facility • Participate in SkillsUSA or TSA

Aligned Industry-Based Certifications

- AWS D1.1 Structural Steel
- C-103 Certified Industry 4.0 Associate - Robot System Operations
- CNC Lathe Operations
- Machining Measurement, Material, and Safety Level I
- Machining Milling Level I
- NCCER Core

Example Postsecondary Opportunities

Associate Degrees
- Industrial Technology
- Instrumentation Technology
- Manufacturing Engineering Technology
- Machine Shop Technology

Bachelor's Degrees
- Engineering/Industrial Management
- Industrial Engineering
- Mechanical Engineering Technology
- Manufacturing Engineering

Master's, Doctoral, and Professional Degrees
- Mechanical Engineering
- Engineering/Industrial Management
- Industrial Engineering
- Engineering

Example Aligned Occupations

Machinists
Median Wage: $48,732
Annual Openings: 3,385
10-Year Growth: 23%

Industrial Engineering Technologists and Technicians
Median Wage: $62,096
Annual Openings: 787
10-Year Growth: 17%

Mechanical Engineers
Median Wage: $99,937
Annual Openings: 1,755
10-Year Growth: 19%

Data Source: TexasWages, Texas Workforce Commission. Retrieved 3/8/2024.

For more information visit: https://tea.texas.gov/academics/college-career-and-military-prep/career-and-technical-education/programs-of-study-additional-resources

Successful completion of the Manufacturing Technology program of study will fulfill requirements of the Business and Industry endorsement.

Texas Education Agency

Manufacturing Technology

Manufacturing Career Cluster

The Manufacturing career cluster focuses on 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 process engineering. This career cluster includes occupations ranging from welder and machinist to industrial engineering technician and semi-conductor processing technician.

Statewide Program of Study: Welding

The Welding Program of Study focuses on the development and use of automatic and computer-controlled machines, tools, and robots that perform work on metal or plastic. CTE learners will learn how to modify parts to make or repair machine tools or maintain individual machines and how to use hand-welding or flame-cutting equipment.

Secondary Courses for High School Credit

Level 1	• Principles of Manufacturing • Introduction to Welding
Level 2	• Welding I
Level 3	• Welding II
Level 4	• Practicum in Manufacturing

Aligned Advanced Academic Courses

Dual Credit	Dual credit offerings will vary by local education agency.

Students should be advised to consider these course opportunities to enrich their preparation. AP or IB courses not listed under the Secondary Courses for High School Credit section of this framework document do not count towards concentrator/completer status for this program of study.

Work-Based Learning and Expanded Learning Opportunities

Work-Based Learning Activities	• Job shadow a welder • Intern for a local welding company
Expanded Learning Opportunities	• Tour a welding shop • Participate in SkillsUSA or TSA • Participate in a welding project that benefits the community

Aligned Industry-Based Certifications

- AWS D1.1 Structural Steel
- AWS D9.1 Sheet Metal Welding
- NCCER Construction Technology Certification Level I
- NCCER Core
- NCCER Welding Level I

Example Postsecondary Opportunities

Apprenticeships
- Welding

Associate Degrees
- Welding Technology
- Building/Construction Site Management
- Operations Management and Supervision

Bachelor's Degrees
- Welding Technology
- Construction Management
- Project Management
- Building/Construction Site Management

Master's, Doctoral, and Professional Degrees
- Engineering
- Engineering/Industrial Management
- Manufacturing Engineering
- Construction Engineering

Example Aligned Occupations

Welders, Cutters, Solderers, and Brazers
Median Wage: $48,177
Annual Openings: 6,792
10-Year Growth: 23%

First-Line Supervisors of Production and Operating Workers
Median Wage: $62,584
Annual Openings: 5,926
10-Year Growth: 17%

Industrial Production Managers
Median Wage: $119,691
Annual Openings: 1,296
10-Year Growth: 19%

Data Source: TexasWages, Texas Workforce Commission. Retrieved 3/8/2024.

For more information visit:
https://tea.texas.gov/academics/college-career-and-military-prep/career-and-technical-education/programs-of-study-additional-resources

Successful completion of the Welding program of study will fulfill requirements of the Business and Industry endorsement.

Texas Education Agency