

CTE: THE KEY TO ECONOMIC DEVELOPMENT

Manufacturing:

Accounts for **11%**
of U.S. GDP¹

Employs
12 million
people²

Pays about
12% more
than other U.S. industries³

What is the pathway to these fulfilling and essential careers?

Career and Technical Education!



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Advanced Manufacturing

Advanced manufacturing sectors:

- top the list of key and emerging industries in many states
- use cutting-edge technology and processes
- require highly skilled workers

What jobs are available in advanced manufacturing?

Manufacturing employs about 8% of the American workforce, with demand steadily rising after a period of decline.⁴ COVID-19 underscored the important role that manufacturing plays in creating products that are critical for health and safety, national security, and the continuity of other industries.⁵ About 4 million manufacturing jobs will be open through 2030; however, more than 2 million of these jobs are expected to go unfilled.⁶ Currently, manufacturing is facing a growing skills gap as employers report needing more workers with technical skills who are interested in learning new technologies.⁷ The advanced manufacturing sectors with strong growth prospects include pharmaceuticals, electronics and aerospace.⁸

Manufacturing is well known for paying a family-sustaining wage, even for workers with less than a bachelor's degree. The average manufacturing employee in 2019 earned more than \$88,000 with benefits,⁹ while front-line production workers with a high school diploma and some postsecondary or on-the-job experience such as welders and machinists can earn above the national median wage – well above in high-tech sectors such as aerospace, motor vehicle parts and plastics manufacturing.¹⁰

Advanced manufacturing employees increasingly benefit from education beyond high school through apprenticeships and community and technical college programs that award postsecondary certificates and associate degrees. Industry-recognized certifications from organizations such as the American Welding Society, the Manufacturing Skill Standards Council, NIMS and the Association for Packaging and Processing Technologies are also a critical asset. These credentials verify technical, employability and academic skills needed to engineer, produce, assemble, sell and distribute goods; maintain equipment; and ensure quality and safety. Advanced manufacturing careers include:

- Production supervisors
- Quality technicians
- Computer-aided drafting technicians
- Mechanical engineering technicians
- CNC machinists
- Safety technicians
- Electronics assembly technicians
- Operation managers



Endnotes

1. National Institute of Standards and Technology. (2020). *Manufacturing industry statistics*. Retrieved from <https://www.nist.gov/el/applied-economics-office/manufacturing/manufacturing-industry-statistics>
2. National Association of Manufacturers. (N.d.). *Facts about manufacturing*. Retrieved from <https://www.nam.org/facts-about-manufacturing>
3. National Institute of Standards and Technology. (2020). *Manufacturing industry statistics*. Retrieved from <https://www.nist.gov/el/applied-economics-office/manufacturing/manufacturing-industry-statistics>
4. McKinsey & Company. (April 15, 2021). *Building a more competitive U.S. manufacturing sector*. Retrieved from <https://www.mckinsey.com/featured-insights/americas/building-a-more-competitive-us-manufacturing-sector>
5. Ibid.
6. National Association of Manufacturers. (N.d.). *Facts about manufacturing*. Retrieved from <https://www.nam.org/facts-about-manufacturing>; Deloitte Insights and Manufacturing Institute. *2018 skills gap in manufacturing study*. Retrieved from <https://operationalsolutions.nam.org/mi-skills-gap-study-18>
7. Rogers, K. (October 4, 2019). *Manufacturing is facing a growing skills gap that is leaving hundreds of thousands of positions open*. CNBC. Retrieved from <https://www.cnbc.com/2019/10/04/manufacturing-sector-is-facing-a-growing-skills-gap.html>
8. McKinsey & Company. (2017). *Making it in America: Revitalizing U.S. manufacturing*. Retrieved from <https://www.mckinsey.com/featured-insights/americas/making-it-in-america-revitalizing-us-manufacturing>
9. National Association of Manufacturers. (N.d.). *Facts about manufacturing*. Retrieved from <https://www.nam.org/facts-about-manufacturing/>
10. U.S. Bureau of Labor Statistics. (N.d.). *Machinists and tool and die makers*. Retrieved from <https://www.bls.gov/ooh/production/machinists-and-tool-and-die-makers.htm>; U.S. Bureau of Labor Statistics. (N.d.). *Welders, cutters, solderers and brazers*. Retrieved from <https://www.bls.gov/ooh/production/welders-cutters-solderers-and-brazers.htm>
11. Iowa Department of Education. (2019). *Iowa advanced manufacturing work-based learning toolkit*. Retrieved from <https://educateiowa.gov/sites/files/ed/documents/ManufacturingToolkit.pdf>
12. SkillsUSA. (N.d.). *Contest descriptions*. Retrieved from <https://www.skillsusa.org/competitions/skillsusa-championships/contest-descriptions/>; Technology Student Association. (N.d.). *High school competitions*. Retrieved from <https://tsaweb.org/competitions-programs/tsa/high-school-competitions/-in-category/categories/manufacturing-and-transportation-technology>
13. Ivy Tech Community College. (N.d.). *Manufacturing production and operations*. Retrieved from <https://www.ivytech.edu/mpro/index.html>
14. Advance CTE. (2019). *Excellence in Action Awards: Kaukauna High School*. Retrieved from https://cte.careertech.org/sites/default/files/KauKauna2paggers_FINAL_0.pdf
15. Advanced Manufacturing Technical Education Collaborative. (N.d.). *About*. Retrieved from <https://amtecworkforce.org/about/>
16. ACTE. (February 12, 2020). *ACTE announces Jason Simon as a 2020 Postsecondary Leadership Success Program Fellow*. Retrieved from https://www.acteonline.org/press-releases/jason_simon/



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How does CTE prepare the advanced manufacturing workforce?

Career and technical education (CTE) prepares high school, postsecondary and adult students for careers in advanced manufacturing through:

- the national Career Clusters® Framework—including Career Clusters and pathways in manufacturing and STEM—which outlines course progression that helps students explore career options and prepares students for college and career success
- CTE courses in machining; welding; wood, metal and plastics processing and production; computer-aided design and computer integrated manufacturing; electro-mechanical systems; and more, all integrated with rigorous academics
- work-based learning experiences, such as the Women in Welding program in Mason City, Iowa, a partnership between North Iowa Area Community College, Iowa Mold Tooling and IowaWORKS Center – Mason City that prepares women for entry-level welding jobs¹¹
- career and technical student organization experiences, such as SkillsUSA and Technology Student Association competitions in additive manufacturing, computer-integrated manufacturing, precision machining, welding and mechatronics¹²
- opportunities to earn stackable credentials, such as Ivy Tech Community College’s Manufacturing Production and Operations pathway, which builds from a technical certificate to an Associate of Applied Science degree¹³

What are promising programs in advanced manufacturing?

At **Kaukauna High School’s** manufacturing program in Kaukauna, Wisconsin, students prepare for high-quality, in-demand careers in the area’s chemical manufacturing facilities through hands-on experiences in machine programming, welding and fabrication, 3D programming and more; rigorous academic coursework; and early postsecondary credit opportunities. Students can choose to participate in apprenticeships through the Wisconsin Youth Apprenticeship program or with a local union, take part in dual enrollment, and earn up to two state-recognized industry certifications before leaving high school. In 2018, all students in the program graduated from high school, participated in work-based learning and earned postsecondary credit, and 90% of these students enrolled in postsecondary education. To help increase program diversity, the department created a STEM Girls Club that has organized events for middle school girls. Kaukauna’s manufacturing program was awarded a 2019 Excellence in Action Award from Advance CTE.¹⁴

The **Automotive Manufacturing Technical Education Collaborative (AMTEC)** is a collaboration between a group of multi-state community and technical colleges and industry partners to better prepare highly skilled mechatronics technicians to work in advanced manufacturing sectors. Postsecondary learners can choose between many career pathways such as Mechanical Engineering Technician, Robotics Automation Technologist and Fluid Power Mechanic. AMTEC’s products and services include industry-led maintenance certification assessments available through Nocti Business Solutions; industry-validated, online competency-based postsecondary curriculum; and professional development and best practices for educators and partners. AMTEC has also developed an Advanced Manufacturing System Simulator V2, which is transportable and adaptable to local needs. Learners can use the simulator to troubleshoot issues, practice safety training, and reinforce basic principles learned in the classroom.¹⁵ Although AMTEC is primarily for postsecondary learners, its Employer Driven Career Pathway Model starts as early as elementary school and aims to create a pipeline of skilled workers to meet industry needs. Jason Simon, the Director of AMTEC, was selected as a fellow for the 2020 Postsecondary Leadership Success Program at ACTE, sponsored by the ECMC Foundation.¹⁶