

CTE: THE KEY TO ECONOMIC DEVELOPMENT

Manufacturing:

Accounts for

11.6%

of U.S. GDP¹

Contributes **trillions** to the economy²

Employs **8.6%** of the nation's workforce³

What is the pathway to these fulfilling and essential careers?

Career and Technical Education!



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Advanced Manufacturing

The growing sub-sector of advanced manufacturing:

- tops the list of key and emerging industries in many states
- uses cutting-edge technology and processes
- requires highly skilled workers

What jobs are available in advanced manufacturing?

Manufacturing employs almost 13 million Americans.⁴ The manufacturing workforce has been growing since the end of the Great Recession, with increasing momentum in the past two years.⁵ Much of industry growth can be attributed to the automotive and aerospace manufacturing sectors, while medical device manufacturing has also been growing steadily.⁶ About 4.6 million manufacturing jobs are predicted through 2028, including new jobs and jobs that will open up owing to retirements.⁷ However, if talent shortages continue, 2.4 million of those positions may go unfilled.⁸ Currently, 89 percent of manufacturers are experiencing talent shortages, with 60 percent reporting a high or very high impact on productivity.⁹

Manufacturing is well known for paying a family-sustaining wage, even for workers with less than a college degree. The average manufacturing employee in 2017 earned almost \$85,000 including benefits, while front-line production workers with at least a high school diploma can earn above the national median wage of \$38,640—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, such as the National Association of Manufacturers-endorsed Skills Certification System, are also a critical asset. Manufacturing executives report that computing, digital and programming skills and critical thinking skills will be most needed in coming years.¹¹ Advanced manufacturing occupations require these and other technical, employability and academic skills in order to produce and assemble goods, maintain equipment, and ensure quality and safety. Advanced manufacturing careers include:

- production supervisors
- quality control inspectors
- welders
- CAD drafting technicians
- mechanical engineers
- numerical tool programmers
- electromechanical technicians
- operations managers



Endnotes

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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 progressions that help students explore career options and prepare for college and career success
- CTE courses in production systems, computer-integrated manufacturing, welding, machining and plastics processing, all integrated with rigorous academics
- work-based learning experiences, such as Flight Plan to Success, a partnership among three Georgia school districts, Columbus Technical College and jet engine manufacturer Pratt & Whitney that enables high school students to earn college credit and a Certified Manufacturing Specialist credential, and intern at Pratt & Whitney¹²
- career and technical student organization experiences, such as SkillsUSA and Technology Student Association competitions in additive manufacturing, computer-integrated manufacturing, CNC machining and mechatronics¹³
- opportunities to earn stackable credentials, such as the career pathway in manufacturing at Oregon's Clackamas Community College, which builds from a short-term certificate in CNC machining to a longer term manufacturing technology certificate to an associate of applied science degree in manufacturing technology¹⁴

What are promising programs in advanced manufacturing?

Students prepare for both college and career success through the award-winning mechatronics program at **Oakland High School** in Murfreesboro, Tennessee. The program developed from an education-industry partnership among the school district, Motlow State Community College (MSCC), Bridgestone and the National Association of Manufacturers' Manufacturing Leadership Council. Based on the Siemens on-the-job training model, the mechatronics program incorporates rigorous academic and technical coursework, industry certifications and dual credit. After completing prerequisites at Oakland, junior and senior students are dually enrolled at MSCC, earning 16 dual credits. Funds from the state and the participating schools ensure that these college courses are low- or no-cost. Students also graduate with Siemens entry-level mechatronics certification. Business and industry leaders have helped market the program to students and parents, which has encouraged the enrollment of female, low-income and minority students.¹⁵

The Hudson Valley of New York is already a leading region for semiconductor manufacturing, and in spring 2019, ON Semiconductor committed to investing more than \$720 million to establish a 300mm chip manufacturing plant in East Fishkill.¹⁶ To support this sector, **Hudson Valley Community College** has developed a program in semiconductor manufacturing as part of its state-of-the-art TEC-SMART (Training and Education Center for Semiconductor Manufacturing and Alternative and Renewable Technologies) facility. Students can earn an associate of applied science degree in semiconductor manufacturing technology, and be prepared to work in capacity field service, testing and manufacturing. Recent graduates have found employment with GlobalFoundries, GE Healthcare and General Electric Global Research Center. TEC-SMART is also home to the Clean Technologies and Sustainable Industries Early College High School, a partnership with the Ballston Spa Central School District, which supports career and college pathways in semiconductor manufacturing as well as renewable energy, entrepreneurship and computer information systems.¹⁷