



# Manufacturing and Product Development Industry Sector

The Manufacturing and Product Development industry sector is an important part of California's economy, producing a wide range of products, including computers, communications equipment, electronic components, high-tech instruments, apparel, metal products, chemicals, plastics, aircraft, ships, missiles and space products, and search and navigation equipment. Both large and small manufacturers are important participants in the electronics, multimedia, and other emergent regional industrial clusters.

This sector provides a foundation in manufacturing processes and systems for all industrial and technology education students in California. These students are engaged in an instructional program that integrates technical preparation and academics with career awareness, career exploration, and skill preparation in four pathways: Graphic Arts Technology, Integrated Graphics Technology, Machine and Forming Technology, and Welding Technology. Manufacturing and Product Development pathways emphasize real-world, occupationally relevant experiences of significant scope and depth in manufacturing and graphic communication. To prepare students for the vast range of career opportunities in manufacturing and product development, middle schools, high schools, regional occupational centers and programs, apprenticeship programs, community colleges, and four-year colleges and universities provide educational and training programs.

## Manufacturing and Product Development Industry Sector Pathways:

- *Graphic Arts Technology*
- *Integrated Graphics Technology*
- *Machine and Forming Technology*
- *Welding Technology*

### Entry Level Careers

*(with high school diploma)*

Desktop Publishing  
Graphic Art Equipment Operator  
Special Effects Animator  
Web Designer  
Pre-Press Designer  
Machine Operator  
Maintenance Mechanic  
Assembler  
Installation Apprentice  
Bindery Workers  
Welder  
Cutter, Solder, Brazier  
Plastics Assembler  
Foundry Helper  
Furniture Finishers  
Upholsterers  
Painting, Coating, and Decorating Workers

### Technical Level Careers

*(with AA or AS degree or certificate)*

Commercial Photographer  
Production Manager  
Graphic Artist Journeyman  
Advertising Design  
Multimedia Digital Editor  
CNC Programmer  
Machine Technician  
Tooling Journeyman  
Industrial Electrician  
Cabinetmakers and Bench Carpenters  
Tool and Die Makers  
Power Plant Operators  
Fabric and Apparel Pattern Makers  
Certified Welder  
Boilermaker  
Foundry Core, Pattern Maker  
Composite Fabricator

### Professional Level Careers

*(with BS or BA degree)*

Publisher, Editor  
Production Developer  
Industrial Technology Instructor  
Network Engineer  
Publications Management  
Multimedia Author  
Manufacturing Engineer  
Mechanical Engineer  
Tooling Engineer  
Design Engineer  
Quality Control Inspector  
Pressurized Vessel Engineer  
Fabrication Designer

## Graphic Arts Technology Pathway

Sample CTE Courses\*

Education Level and Related Occupations\*\*

Introductory	Concentration	Capstone	High School Diploma	Certification and/or AA Degree	Bachelor's Degree or Higher
<ul style="list-style-type: none"> <li>▪ Drafting</li> <li>▪ Exploring Technology</li> <li>▪ Orientation to Graphic Arts Apprenticeship</li> <li>▪ Technology Core</li> </ul>	<ul style="list-style-type: none"> <li>▪ Communications Technology</li> <li>▪ Graphic Arts/Communications</li> <li>▪ Photography Laboratory</li> </ul>	<ul style="list-style-type: none"> <li>▪ Commercial Photography</li> <li>▪ Composition, Lithography, and Platemaking</li> <li>▪ Composition, Makeup, and Typesetting</li> <li>▪ Desktop Publishing</li> </ul>	<ul style="list-style-type: none"> <li>▪ Desktop Publisher</li> <li>▪ Graphic Art Equipment Operator</li> <li>▪ Network Installer+</li> <li>▪ Pre-Press Designer</li> <li>▪ Graphic Arts Apprentice</li> </ul>	<ul style="list-style-type: none"> <li>▪ Commercial Photographer</li> <li>▪ Production Manager</li> <li>▪ Network Administrator+</li> <li>▪ Graphic Artist (Journeyman)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Publisher, Editor</li> <li>▪ Product Developer</li> <li>▪ Industrial Technology Educator+</li> <li>▪ Network Engineer+</li> <li>▪ Graphic Designer</li> </ul>

## Integrated Graphics Technology Pathway

Sample CTE Courses\*

Education Level and Related Occupations\*\*

Introductory	Concentration	Capstone	High School Diploma	Certification and/or AA Degree	Bachelor's Degree or Higher
<ul style="list-style-type: none"> <li>▪ Drafting/Communications</li> <li>▪ Exploring Technology</li> <li>▪ Graphic Arts</li> <li>▪ Graphic Communications Apprenticeship Awareness</li> <li>▪ Technology Core</li> </ul>	<ul style="list-style-type: none"> <li>▪ Communications Technology</li> <li>▪ Graphic Communications</li> <li>▪ Graphic Communications Apprenticeship Explorations</li> <li>▪ Photography Laboratory</li> <li>▪ Video Production</li> </ul>	<ul style="list-style-type: none"> <li>▪ Animation</li> <li>▪ Broadcasting Production</li> <li>▪ Multimedia</li> <li>▪ Orientation to Graphic Communications Apprenticeship</li> </ul>	<ul style="list-style-type: none"> <li>▪ Desktop Publisher</li> <li>▪ Special Effects Animator</li> <li>▪ Special Effects Apprentice</li> <li>▪ Video Graphics Helper</li> <li>▪ Web Designer</li> </ul>	<ul style="list-style-type: none"> <li>▪ Advertising Design</li> <li>▪ Multimedia/Digital Editor</li> <li>▪ Special Effects Editor</li> <li>▪ Special Effects Journeyman</li> <li>▪ Webmaster</li> </ul>	<ul style="list-style-type: none"> <li>▪ Industrial and Technology Educator+</li> <li>▪ Multimedia Author</li> <li>▪ Multimedia/Digital Producer</li> <li>▪ Publications Management</li> <li>▪ Special Effects Engineer</li> </ul>

\*Sample CTE Courses are from the Career Technical Education Framework for California Public Schools (California Department of Education: 2007, <http://www.cde.ca.gov/re/pn/fd/>)

\*\*Visit ASSIST ([www2.assist.org/browseAreas.do](http://www2.assist.org/browseAreas.do)) for community college and UC/CSU information and California Career Zone ([www.cacareerzone.org](http://www.cacareerzone.org)) for occupation information.

+This occupation requires certification or licensure.

Related Career Technical Student Organization: SkillsUSA (<http://www.skillsusaca.com>)

Additional Industry Sector information available through the California Industrial and Technology Education Consortium (<http://www.citeonline.org>).

## Machine and Forming Technology Pathway

Sample CTE Courses\*

Education Level and Related Occupations\*\*

Introductory	Concentration	Capstone	High School Diploma	Certification and/or AA Degree	Bachelor's Degree or Higher
<ul style="list-style-type: none"> <li>▪ Drafting</li> <li>▪ Exploring Technology</li> <li>▪ Metalworking</li> <li>▪ Orientation to Machine and Forming Apprenticeship</li> <li>▪ Technology Core</li> </ul>	<ul style="list-style-type: none"> <li>▪ Ironworking</li> <li>▪ Machine Shop</li> <li>▪ Manufacturing I</li> <li>▪ Plastics/Composites</li> <li>▪ Sheet Metal</li> </ul>	<ul style="list-style-type: none"> <li>▪ Foundry/Metallurgy</li> <li>▪ Machine Tool Operations</li> <li>▪ Manufacturing II</li> <li>▪ Plastics/Composites</li> </ul>	<ul style="list-style-type: none"> <li>▪ Assembler</li> <li>▪ Electro-Mechanical Helper</li> <li>▪ Installation Apprentice</li> <li>▪ Machine Operator</li> <li>▪ Maintenance Mechanic</li> </ul>	<ul style="list-style-type: none"> <li>▪ CNC Programmer</li> <li>▪ Industrial Electrician+</li> <li>▪ Machine Technician</li> <li>▪ Manager</li> <li>▪ Tooling Journeyman</li> </ul>	<ul style="list-style-type: none"> <li>▪ Design Engineer</li> <li>▪ Industrial Technology Educator+</li> <li>▪ Manufacturing Engineer+</li> <li>▪ Mechanical Engineer+</li> <li>▪ Tooling Engineer</li> </ul>

## Welding Technology Pathway

Sample CTE Courses\*

Education Level and Related Occupations\*\*

Introductory	Concentration	Capstone	High School Diploma	Certification and/or AA Degree	Bachelor's Degree or Higher
<ul style="list-style-type: none"> <li>▪ Exploring Technology</li> <li>▪ Metalworking</li> <li>▪ Orientation to Welding Apprenticeship</li> <li>▪ Technology Core</li> <li>▪ Welding Fundamentals</li> </ul>	<ul style="list-style-type: none"> <li>▪ Manufacturing/Materials Processing</li> <li>▪ Technical Drafting</li> <li>▪ Welding Fabrication, Ironworking</li> <li>▪ Welding-Combination I</li> <li>▪ Welding-Electrical</li> </ul>	<ul style="list-style-type: none"> <li>▪ Computer-aided Drafting (CAD)</li> <li>▪ Computer-aided Manufacturing (CAM)</li> <li>▪ Foundry</li> <li>▪ Welding-Combination II</li> <li>▪ Welding-Specialized</li> </ul>	<ul style="list-style-type: none"> <li>▪ Cutter, Solder, Brazier</li> <li>▪ Foundry Helper</li> <li>▪ Plastics Assembler</li> <li>▪ Welder</li> <li>▪ Welding Apprentice+</li> </ul>	<ul style="list-style-type: none"> <li>▪ Boilermaker+</li> <li>▪ Certified Welder+</li> <li>▪ Composite Fabricator</li> <li>▪ Foundry Core, Pattern Maker</li> <li>▪ Welding Journeyman+</li> </ul>	<ul style="list-style-type: none"> <li>▪ Fabrication Designer</li> <li>▪ Industrial Technology Educator+</li> <li>▪ Manufacturing Engineer</li> <li>▪ Pressurized Vessel Engineer+</li> <li>▪ Quality Control Inspector</li> </ul>

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