



Manufacturing: Manufacturing Production Process Development Career Pathway Plan of Study for ▶ Learners ▶ Parents ▶ Counselors ▶ Teachers/Faculty

This Career Pathway Plan of Study (based on the Manufacturing Production Process Development Pathway of the Manufacturing Career Cluster) can serve as a guide, along with other career planning materials, as learners continue on a career path. Courses listed within this plan are only recommended coursework and should be individualized to meet each learner's educational and career goals. *This Plan of Study, used for learners at an educational institution, should be customized with course titles and appropriate high school graduation requirements as well as college entrance requirements.

EDUCATION LEVELS	GRADE	English/ Language Arts	Math	Science	Social Studies/ Sciences	Other Required Courses Other Electives Recommended Electives Learner Activities	*Career and Technical Courses and/or Degree Major Courses for Manufacturing Production Process Development Pathway	SAMPLE Occupations Relating to This Pathway
<i>Interest Inventory Administered and Plan of Study Initiated for all Learners</i>								
SECONDARY	9	English/ Language Arts I	Algebra I	Earth or Life or Physical Science	State History Civics	All plans of study should meet local and state high school graduation requirements and college entrance requirements. Certain local student organization activities are also important including public speaking, record keeping and work-based experiences.	<ul style="list-style-type: none"> • Introduction to Manufacturing Occupations 	<ul style="list-style-type: none"> ▶ Design Engineer ▶ Electrical and Electronic Technician and Technologist ▶ Electronics Engineer ▶ Engineering and Related Technician and Technologist ▶ Industrial Engineer ▶ Labor Relations Manager ▶ Manufacturing Engineer ▶ Manufacturing Technician ▶ Power Generating and Reactor Plant Operator ▶ Precision Inspector, Tester and Grader ▶ Process Improvement Technician ▶ Production Manager ▶ Purchasing Agent ▶ Supervisor
	10	English/ Language Arts II	Geometry	Biology	U.S. History		<ul style="list-style-type: none"> • Information Technology Applications 	
	11	English/ Language Arts III	Algebra II	Chemistry	World History Economics		<ul style="list-style-type: none"> • Employment in Manufacturing Occupations 	
	<i>College Placement Assessments-Academic/Career Advisement Provided</i>							
	12	English/ Language Arts IV	Trigonometry or Statistics or other math course	Physics	Psychology	<ul style="list-style-type: none"> • Applications in Manufacturing Technology 		
<i>Articulation/Dual Credit Transcribed-Postsecondary courses may be taken/moved to the secondary level for articulation/dual credit purposes.</i>								
POSTSECONDARY	Year 13	English Composition English Literature	Algebra	Chemistry Physics	American Government Psychology	All plans of study need to meet learners' career goals with regard to required degrees, licenses, certifications or journey worker status. Certain local student organization activities may also be important to include.	<ul style="list-style-type: none"> • Quality Assurance Concepts and Techniques • Safety in the Workplace • Strategies to Ensure Continuous Improvement in Manufacturing 	
	Year 14	Speech/ Oral Communication	Computer Applications	Biological Science Physical Science	American History Geography		<ul style="list-style-type: none"> • Manufacturing Production Processes • Design for Manufacturability 	
	Year 15	Continue courses in the area of specialization.					<ul style="list-style-type: none"> • Continue Courses in the Area of Specialization 	
	Year 16						<ul style="list-style-type: none"> • Complete Manufacturing Major (4-Year Degree Program) 	

Creating Your Institution's Own Instructional Plan of Study

With a team of partners (secondary/postsecondary teachers and faculty, counselors, business/industry representatives, instructional leaders, and administrators), use the following steps to develop your own scope and sequence of career and technical courses as well as degree major courses for your institution's plan of study.

- 1** Crosswalk the Cluster Foundation Knowledge and Skills (available at <http://www.careerclusters.org/goto.cfm?id=94>) to the content of your existing secondary and postsecondary programs/courses.
- 2** Crosswalk the Pathway Knowledge and Skills (available at <http://www.careerclusters.org/goto.cfm?id=61>) to the content of your existing secondary/postsecondary programs and courses.
- 3** Based on the crosswalks in steps 1 and 2, determine which existing programs/courses would adequately align to (cover) the knowledge and skills. These programs/courses would be revised to tighten up any alignment weaknesses and would become a part of a sequence of courses to address this pathway.
- 4** Based on the crosswalks in steps 1 and 2, determine what new courses need to be added to address any alignment weaknesses.
- 5** Sequence the **content** and **learner outcomes** of the existing programs/courses identified in step 3 and new courses identified in step 4 into a course sequence leading to preparation for all occupations within this pathway. (See list of occupations on page 1 of this document.)
- 6** The goal of this process would be a series of courses and their descriptions. The names of these courses would be inserted into the *Career and Technical Courses* column on the Plan of Study on page 1 of this document.
- 7** Below is a **sample result** of steps 1-6, and these course titles are inserted into the Plan of Study on page 1 of this document.
- 8** Crosswalk your state academic standards and applicable national standards (e.g., for mathematics, science, history, language arts, etc.) to the sequence of courses formulated in step 6.

Manufacturing: Manufacturing Production Process Development

SAMPLE Sequence of Courses for ► Instructional Leaders ► Administrators ► Counselors ► Teachers/Faculty

SAMPLE

Below are suggested courses that could result from steps 1-6 above. However, as an educational institution, course titles, descriptions and the sequence will be your own. This is a good model of courses for you to use as an example and to help you jump-start your process. Course content may be taught as concepts within other courses, or as modules or units of instruction.

The following course is based on the Cluster Foundation Knowledge and Skills found at <http://www.careerclusters.org/goto.cfm?id=94>. These skills are reinforced through participation in student organization activities.

#1

Introduction to Manufacturing Occupations: This course provides students an opportunity to experience various professional organized skill areas. These experiences are designed to be similar to occupations actually existing in the commercial/industrial workplace. This may be taught as a career exploration course in conjunction with other foundation Career Cluster courses.

The following course is based on the Cluster Foundation Knowledge and Skills as well as the Pathway Knowledge and Skills found at <http://www.careerclusters.org/goto.cfm?id=61>. These skills are reinforced through participation in student organization activities.

#2

Information Technology Applications: Students will use technology tools to manage personal schedules and contact information, create memos and notes, prepare simple reports and other business communications, manage computer operations and file storage, and use electronic mail and Internet applications to communicate, search for and access information.

The following courses expose students to Pathway Knowledge and Skills found at <http://www.careerclusters.org/goto.cfm?id=61> and should include appropriate student activities.

#3

Employment in Manufacturing Occupations: Students will study the roles and responsibilities of various occupations related to manufacturing. Students will research available sources to acquire knowledge of how to maintain a safe and productive workplace including following local, federal and company regulations to perform environmental and safety inspections. Students will develop strategies for communicating with coworkers and/or external customers to ensure production meets business requirements and learn strategies for maintaining equipment, tools and workstations. A work-based learning component is encouraged.

#4

Applications in Manufacturing Technology: This course prepares students for careers in manufacturing and for postsecondary education. The main focus is a core structure study in hydraulics, pneumatics, electrical, material testing, sensors, electric and pneumatic robot operations, and an introduction to programmable logic controllers, measurement, and materials characterization. A work-based learning component is provided.

#5

Quality Assurance Concepts and Techniques: Students will learn concepts of maintaining quality and implementing improvement processes while ensuring that these processes lead to products and meet quality standards. Students will learn the use of audits and inspections to maintain quality. Students will learn to use metrology, materials characterization and statistical process control as used in the manufacturing industry. This course includes content related to conducting an in-depth investigation to identify customer needs, verifying that needed resources are available, setting up production equipment, using process control data, inspecting the product, documenting product and process against customer requirements, and checking for specified quantities and proper documentation to prepare a final product for shipping or distribution.

#6

Safety in the Workplace: Students will develop in-depth skills for maintaining a safe and productive environment including following regulations to perform inspections, participate in emergency response teams to perform emergency drills, identify unsafe conditions and take corrective actions, and provide a safety orientation to train other employees in safe practices and emergency procedures. Students will ensure that equipment is being used safely in the workplace by training others to use equipment safely; by suggesting processes and procedures to support safety; by developing skills in incident and accident investigation; by fulfilling safety and health requirements for maintenance, installation and repair; and by monitoring equipment and operator performance to assure workplace safety and compliance with both company and national regulations.

#7

Strategies to Ensure Continuous Improvement in Manufacturing: Students will develop strategies to produce a product to satisfy customer needs and desires. Students will identify and rank customer needs, verify that needed resources are available, manage equipment setup, use process control data for fabrication and check issues related to the final product. The focus of this course will be on continuous improvement with steps identified that should be used in manufacturing processes.

#8

Manufacturing Production Processes: Students will study processes for implementing new manufacturing products including the research, standard operating procedures, tooling and fixtures, program equipment, scheduling, performance data, employee training and documentation of new processes.

#9

Design for Manufacturability: Students will learn concepts for designing and producing a product to meet customer needs. Course content includes processes for conducting research for new products, obtaining required supplies, executing processes to produce the new product, inspecting the product for deviations from specifications, evaluating prototypes for manufacturability, solving production process problems, managing product life-cycle and delivering the finished product to the next stage in the production process.



Notes

A large rectangular area with horizontal stripes, alternating between light blue and light brown, intended for writing notes.