



# SAMPLE

## Manufacturing: Maintenance, Installation and Repair

### Career Pathway Plan of Study for ► Learners ► Parents ► Counselors ► Teachers/Faculty

This Career Pathway Plan of Study (based on the Maintenance, Installation and Repair 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 Maintenance, Installation and Repair Pathway	SAMPLE Occupations Relating to This Pathway
Interest Inventory Administered and Plan of Study Initiated for all Learners								
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.	• Introduction to Manufacturing Occupations	<ul style="list-style-type: none"><li>▶ Biomedical Equipment Technician</li><li>▶ Boilermaker</li><li>▶ Communication System Installer/Repairer</li><li>▶ Computer Installer/Repairer</li><li>▶ Computer Maintenance Technician</li><li>▶ Electrical Equipment Installer/Repairer</li><li>▶ Facility Electrician</li><li>▶ Industrial Electronic Installer/Repairer/Manager</li><li>▶ Industrial Machinery Mechanic</li><li>▶ Industrial Maintenance Electrician</li><li>▶ Industrial Maintenance Technician/Mechanic</li><li>▶ Instrument Calibration and Repairer</li><li>▶ Instrument Control Technician</li><li>▶ Job/Fixture Designer</li><li>▶ Laser Systems Technician</li><li>▶ Maintenance Repairer</li><li>▶ Major Appliance Repairer</li><li>▶ Meter Installer/Repairer</li><li>▶ Plumber, Pipe Fitter and Steam Fitter</li><li>▶ Security System Installer</li></ul>
	10	English/ Language Arts II	Geometry	Biology	U.S. History		• Information Technology Applications	
	11	English/ Language Arts III	Algebra II	Chemistry	World History Economics		• Employment in Manufacturing Occupations	
	College Placement Assessments-Academic/Career Advisement Provided							
	12	English/ Language Arts IV	Trigonometry or Statistics or other math course	Physics	Psychology		• Applications in Manufacturing Technology	
Articulation/Dual Credit Transcribed-Postsecondary courses may be taken/moved to the secondary level for articulation/dual credit purposes.								
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.	• Safety in the Workplace • Workplace Communication	<ul style="list-style-type: none"><li>▶ Instrument Calibration and Repairer</li><li>▶ Instrument Control Technician</li><li>▶ Job/Fixture Designer</li><li>▶ Laser Systems Technician</li><li>▶ Maintenance Repairer</li><li>▶ Major Appliance Repairer</li><li>▶ Meter Installer/Repairer</li><li>▶ Plumber, Pipe Fitter and Steam Fitter</li><li>▶ Security System Installer</li></ul>
	Year 14	Speech/ Oral Communication	Computer Applications	Biological Science Physical Science	American History Geography		• Predictive and Preventive Maintenance • Manufacturing Equipment	
	Year 15	Continue courses in the area of specialization.					• Continue Courses in the Area of Specialization	
	Year 16						• Complete Manufacturing Major (4-Year Degree Program)	

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### *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=62>) 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** The SAMPLE on page 4 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: Maintenance, Installation and Repair

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

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*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=62>. 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=62> 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 provided.

#### #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

*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 including machine guards, light curtains, sensors and robotics are being used safely in the workplace by training others to use equipment safely; by suggesting processes and procedures to support safety; 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. This course will include strategies for maintaining high water and air-quality standards in the workplace.

#### #6

*Workplace Communication:* Students will develop verbal and visual skills for communicating with others to ensure that manufacturing maintenance and repairs meet business needs while increasing time efficiency.

#### #7

*Predictive and Preventive Maintenance:* Students will gain skills related to maintaining hands-on knowledge of equipment operation to identify maintenance needs. Students will learn to follow a preventive maintenance schedule to maintain equipment, tools and workstations and coordinate predictive and preventive maintenance to ensure that the production process runs smoothly.

#### #8

*Manufacturing Equipment:* This course teaches students to identify and diagnose equipment problems and then make repairs by gathering equipment information and history, following procedures to isolate system and component failure, identifying the root cause of the problem, developing and executing the corrective action plan, and documenting the diagnosis, case history plan and repair outcome. Students will also learn to support the installation, customization and/or upgrading of equipment.



## Notes