

## WTCS Repository

# Program Design

50-423-1 MAINTENANCE MECHANIC/MILLWRIGHT APPRENTICE

Description

Maintenance mechanics and millwrights install, dismantle, or move machinery and heavy equipment according to layout plans, blueprints, or other drawings. They keep machines, mechanical equipment, or the structure of an establishment in repair. Duties may involve pipe-fitting; boiler making; insulating; welding; machining; carpentry; repairing electrical or mechanical equipment; installing; aligning; and balancing new equipment; and repairing buildings, floors, or stairs. This program provides the related instruction portion for this trade's apprenticeship.

###### Related Outcomes

### Program Outcomes

|  |  |
| --- | --- |
| 1 | Demonstrate proper rigging techniques. |
| 2 | Select an appropriate power transmission system for a given application. |
| 3 | Identify suitable pumps for given applications. |
| 4 | Recommend bearings for given applications. |
| 5 | Plan for fabricating parts and assemblies according to specifications. |
| 6 | Apply operational and troubleshooting principles to fluid power systems. |
| 7 | Layout an equipment installation plan. |
| 8 | Plan maintenance schedules for a given system. |

# Maintenance Mechanic Apprenticeship Related Instruction

Description

This program configuration represents an aligned model for paid related instruction that comprises 4 years and 8 semesters (terms).  It reflects a total of 576 hours of combined on-campus lecture, lab, shop, and hands-on learning.  The alignment model reflects courses which can be used to assess program outcomes under TSA.  The alignment model shows program outcomes which are aligned with relevant industry/manufacturing standards.  The alignment model lists courses common to all programs across the colleges.  Further, the alignment model reflects common course numbers that colleges may use across the WTCS in the future (along with recommended hours and credits).  The aligned curriculum is a model that colleges may implement as they need to meet local needs along with hours dedicated for local options.  
  
In April 2013, state advisory committee re-validated their belief that the curriculum model should follow a "lazy Susan" approach.  This means an apprentice may begin at any point in the 8-term/4-year sequence and that there would not be any pre-requisites for any courses.  The state committee also understands and supports that some colleges may want to implement a building curriculum model for related instruction...aka term 1 is foundational to term 2 and term 2 might be a pre-requisite for term 3 and so forth.  Colleges and local committees should determine what best supports employer needs and apprentice success in the trade; however the competencies in each course should be addressed at a minimum.

Credits

|  |  |
| --- | --- |
| Total Credits | 18.5 |

## Term 1

|  |  |  |
| --- | --- | --- |
| Course # | Course Title | Credits |
| 50-423-710 | Math and Physics for MMMP Trades (C1) | 1 |
| 50-423-711 | Print Reading for MMMP Trades (C-2) | 1 |

## Term 2

|  |  |  |
| --- | --- | --- |
| Course # | Course Title | Credits |
| 50-423-714 | Rigging for MMMP Trades (C-5) | 1 |
| 50-423-715 | Welding for MMMP Trades (C-6) | .5 |
| 50-423-716 | Metallurgy for MMMP Trades (C-7) | .5 |
| 50-423-712 | Fasteners for MMMP Trades (C-3) | .25 |
| 50-423-713 | Precision Measurements for MMMP Trades (C-4) | .5 |

## Term 3

|  |  |  |
| --- | --- | --- |
| Course # | Course Title | Credits |
| 50-423-717 | Hydraulics for MMMP Trades (C-8) | .75 |
| 50-423-718 | Pneumatics & Compressed Air for MMMP Trades (C-9) | .75 |
| 50-423-719 | Vacuum Systems for MMMP Trades (C-10) | .75 |
| 999-999 | Local College Options for MMMP @ 12 hours | .5 |

## Term 4

|  |  |  |
| --- | --- | --- |
| Course # | Course Title | Credits |
| 50-423-720 | Pipefitting and Valves for MMMP Trades (C-11) | .75 |
| 50-423-722 | Packings, Seals, Gaskets for MMMP Trades (C-13) | .5 |
| 50-423-723 | SDS & Adhesives and Sealants for MMMP Trades (C-14) | .25 |
| 50-423-732 | Pumps for the MMMP Trades (M-3) | .75 |

## Term 5

|  |  |  |
| --- | --- | --- |
| Course # | Course Title | Credits |
| 50-423-726 | Green Awareness for the MMMP Trades (C-17) | 1 |
| 50-423-724 | Preventive and Predictive Maintenance for MMMP Trades (C-15) | 1 |

## Term 6

|  |  |  |
| --- | --- | --- |
| Course # | Course Title | Credits |
| 50-423-730 | Bearings for the MMMP Trades (M-1) | .75 |
| 50-423-731 | Couplings & Alignment for the MMMP Trades (M-2) | 1 |
| 999-999 | Local College Options for MMMP @ 12 hours | .5 |

## Term 7

|  |  |  |
| --- | --- | --- |
| Course # | Course Title | Credits |
| 50-423-733 | Belts, Sheaves, Pulleys and Drives for the MMMP Trades (M-4) | .75 |
| 50-423-734 | Gears, Gearboxes, Gear Assemblies for the MMMP Trades (M-5) | .75 |
| 50-423-735 | Mechanical Power Transmission for the MMMP Trades (M-6) | .75 |

## Term 8

|  |  |  |
| --- | --- | --- |
| Course # | Course Title | Credits |
| 50-423-736 | Conveyors for the MMMP Trades (M-7) | .25 |
| 50-423-737 | Equipment Installation for the MMMP Trades (M-8) | .75 |
| 50-423-738 | Sheet Metal and Structural Steel Fabrication for the MMMP Trades (M-9) | .75 |
| 999-999 | Local College Options for MMMP @ 16 hours | .5 |

## Local Options for MMMP Trades

|  |  |  |
| --- | --- | --- |
| Course # | Course Title | Credits |
| 999-999 | Carpentry (L-1) |  |
| 999-999 | Computer Basics (L-2) |  |
| 999-999 | Concrete (L-3) |  |
| 999-999 | Electricity (L-4) |  |
| 999-999 | Machine Lubrication (L-5) |  |
| 999-999 | Machine Shop Fundamentals (L-6) |  |
| 999-999 | Plastics (L-7) |  |
| 999-999 | Refrigeration & AC (L-8) |  |
| 999-999 | Heat Treat & Burners (L-9) |  |

### Program Course List

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number | Title | Credits | Description | Pre/Corequisites |
| 50-423-710 | Math and Physics for MMMP Trades (C1) | 1 | This course examines math and physics concepts as they relate to millwrights and machine maintenance.  Apprentices will develop skills related to converting fractions to decimals; using both standard and metric systems; applying basic algebra to solving problems; computing area, volume, mass, and torque; using basic trigonometry; and using math charts, tables and references in support of common work processes. |  |
| 50-423-711 | Print Reading for MMMP Trades (C-2) | 1 | This course explores reading prints commonly used by millwrights and machine maintenance workers.  Course competencies include comparing the types of prints, interpreting structural drawings, identifying parts from prints, and develops apprentice sketching drawing skills. |  |
| 50-423-712 | Fasteners for MMMP Trades (C-3) | .25 | Course provides apprentices with a chance to compare fasteners and their uses, analyze fastener failures, and install mechanical fasteners. Formerly module C-3 for related instruction in the MMMP apprenticeship program. |  |
| 50-423-713 | Precision Measurements for MMMP Trades (C-4) | .5 | This course develops apprentice skills in precision measurement.  Types of measuring instruments will be compared and then measuring skills using tapes, steel rules, micrometers, calipers, indicators, and gauges will be developed.  This was formerly the C-4 module in related instruction for the MMMP trade apprenticeship. |  |
| 50-423-714 | Rigging for MMMP Trades (C-5) | 1 | Apprentices will compare types of rigging equipment and their uses; determine safe loads, rig and crib loads, and move a load with cranes and hoists in this course.  This course was formerly the C-5 module for related instruction in the MMMP apprenticeship. |  |
| 50-423-715 | Welding for MMMP Trades (C-6) | .5 | Course compares common welding processes and develops apprentice skills related to welding, cutting, heating and using oxy-gas.  Welding with arc, MIG and TIG is included, along with common cutting and joining techniques.  This course was the former C-6 module for the MMMP apprenticeship program. |  |
| 50-423-716 | Metallurgy for MMMP Trades (C-7) | .5 | This course develops apprentice skills regarding metallurgical concepts.  Apprentices will compare various metals and their applications, apply metallurgical techniques to work processes, test metals for hardness, and examine heat treating applications.  This course is the former C-7 module for the MMMP apprenticeship program. |  |
| 50-423-717 | Hydraulics for MMMP Trades (C-8) | .75 | This course provides instruction to apprentices concerning many aspects of inspecting, servicing, and troubleshooting hydraulic systems and components. Apprentices will learn safety related issues and be taught proper safety procedures for working with hydraulic systems and components.  It was formerly the C-8 module for the MMMP apprenticeship program. |  |
| 50-423-718 | Pneumatics & Compressed Air for MMMP Trades (C-9) | .75 | This course was formerly the C-9 module for the MMMP apprenticeship.  It provides instruction to apprentices concerning many aspects of inspecting, servicing, and troubleshooting pneumatic systems and components. Apprentices will learn safety related issues and be taught proper safety procedures for working with pneumatic systems and components. |  |
| 50-423-719 | Vacuum Systems for MMMP Trades (C-10) | .75 | Course introduces principles of vacuum systems and interpreting vacuum system schematics. Apprentices will then develop skills related to installing, repairing, replacing and applying troubleshooting principles to vacuum systems and components. Course examines preventative maintenance techniques commonly used on the job. This course was formerly the C-10 module in related instruction for the MMMP apprenticeship. |  |
| 50-423-720 | Pipefitting and Valves for MMMP Trades (C-11) | .75 | Course introduces apprentices to pipe sizes, materials and schedules, examines fittings, tubing and valves, and develops skills related to layout, installation, and maintenance. This course was formerly the C-11 module for the MMMP apprenticeship program. |  |
| 50-423-722 | Packings, Seals, Gaskets for MMMP Trades (C-13) | .5 | Apprentices will examine packing, seals, and gaskets and compare materials and applications.  Then skills in layout, cutting, inspecting, removing, and installing these components will be developed.  This course was the former C-13 module for the MMMP apprenticeship program. |  |
| 50-423-723 | SDS & Adhesives and Sealants for MMMP Trades (C-14) | .25 | This course was formerly the C-14 module in related instruction for the MMMP apprenticeship. In 2013, based on instructor review, the competencies, performance standards, and learning objectives from the C-14 module was added to this course.  Hours reflect the combined modules. |  |
| 50-423-724 | Preventive and Predictive Maintenance for MMMP Trades (C-15) | 1 | Course examines both preventative and predictive maintenance concepts as they apply to millwright work processes and machine maintenance.  Apprentices will develop skills related to assessing machine conditions and faults based on both preventative and predictive maintenance.  This course is the former C-15 module in related instruction for the MMMP apprenticeship program. |  |
| 50-423-726 | Green Awareness for the MMMP Trades (C-17) | 1 | Green Awareness for the MMMP Trades examines how green projects and sustainable manufacturing initiatives relate to energy efficiency, energy consumption, waste reduction, and changing work processes for the MMMP related trades. Priorities related to cost awareness, energy efficiency, predictive and preventative maintenance, new materials, bearing maintenance, and precision laser alignment are included in this course. Each competency can stand alone and be added to existing modules in the paid related instruction program, or the course can be delivered in its entirety as a new module in the curriculum. Estimated hours shown with each competency are intended to guide educators and employers with planning, and may be modified to meet local needs. Course was formerly the C-17 module in related instruction for the MMMP apprenticeship programs. |  |
| 50-423-730 | Bearings for the MMMP Trades (M-1) | .75 | Apprentices will examine bearing types and applications, and compare equipment bearings. Then learners will develop skills related to bearing inspection, selection, removal, mounting, lubrication and diagnosing bearing failures. Course was formerly the M-1 module in related instruction for the MMMP apprenticeship. |  |
| 50-423-731 | Couplings & Alignment for the MMMP Trades (M-2) | 1 | Course compares different coupling types and examines common misalignment problems. Apprentices will develop skills related to inspecting, troubleshooting, and preparing couplings for removal and installation, and also aligning and lubricating couplings. This course was formerly the M-2 module for related instruction in the MMMP apprenticeship programs. |  |
| 50-423-732 | Pumps for the MMMP Trades (M-3) | .75 | Course compares different pump types and their applications. Apprentices will complete a field inspection of pumps and learn how to troubleshoot, remove, overhaul, install and perform preventative maintenance on pumps. This course was formerly the M-3 module for related instruction in the MMMP apprenticeship programs. |  |
| 50-423-733 | Belts, Sheaves, Pulleys and Drives for the MMMP Trades (M-4) | .75 | Course compares different belt types and drive components. Apprentices will develop skills related to inspecting, troubleshooting, removing, selecting, and installing belt drive systems. This course was formerly the M-4 module for related instruction in the MMMP apprenticeship programs. |  |
| 50-423-734 | Gears, Gearboxes, Gear Assemblies for the MMMP Trades (M-5) | .75 | Course compares gear types and applications. Apprentices will develop skills inspecting gear assemblies, troubleshooting gear problems, removing gears and components, and reassembling gear drive systems. This course was formerly the M-5 module in related instruction for the MMMP apprenticeship programs. |  |
| 50-423-735 | Mechanical Power Transmission for the MMMP Trades (M-6) | .75 | Course examines drive transmission systems and their applications, including roller chains. Apprentices will develop skills inspecting power transmission systems and troubleshooting mechanical drive systems. This course was formerly the M-6 module in related instruction for the MMMP apprenticeship programs. |  |
| 50-423-736 | Conveyors for the MMMP Trades (M-7) | .25 | Course examines chain, belt, and other types of conveyors and related components. This course was formerly the M-7 module in related instruction for the MMMP apprenticeship programs. |  |
| 50-423-737 | Equipment Installation for the MMMP Trades (M-8) | .75 | Apprentices will layout equipment installations, plan for moving equipment, and set and level equipment. This course was formerly the M-8 module for related instruction in the MMMP apprenticeship programs. |  |
| 50-423-738 | Sheet Metal and Structural Steel Fabrication for the MMMP Trades (M-9) | .75 | Course compares types of sheet metal and tools used by the trade. Apprentices will develop skills related to fabricating sheet metal and structural steel and then erecting structural steel. This course was formerly the M-9 module in related instruction for the MMMP apprenticeship programs. |  |

50-423-710 Math and Physics for MMMP Trades (C1)

# Course Outcome Summary

### Course Information

|  |  |  |
| --- | --- | --- |
|  | Description | This course examines math and physics concepts as they relate to millwrights and machine maintenance.  Apprentices will develop skills related to converting fractions to decimals; using both standard and metric systems; applying basic algebra to solving problems; computing area, volume, mass, and torque; using basic trigonometry; and using math charts, tables and references in support of common work processes. |
|  | Instructional Level | Technical Diploma |
|  | Total Credits | 1 |
|  | Total Hours | 36 |

### Course Competencies

|  |  |
| --- | --- |
| 1. | Convert between fractions and decimals |
| 2. | Convert between standard and metric units |
| 3. | Solve basic algebra problems for unknowns such as Horse Power, pressures, etc. |
| 4. | Calculate area, volume, weight, and torque |
| 5. | Solve equations with ratios and proportions |
| 6. | Use math, charts, tables, and references to solve measurement problems |
| 7. | Apply concepts of simple machines to the disassembly and moving of equipment |
| 8. | Apply trigonometry concepts to piping systems and mechanical math problems |

50-423-711 Print Reading for MMMP Trades (C-2)

# Course Outcome Summary

### Course Information

|  |  |  |
| --- | --- | --- |
|  | Description | This course explores reading prints commonly used by millwrights and machine maintenance workers.  Course competencies include comparing the types of prints, interpreting structural drawings, identifying parts from prints, and develops apprentice sketching drawing skills. |
|  | Total Credits | 1 |
|  | Total Hours | 36 |

### Course Competencies

|  |  |
| --- | --- |
| 1. | Examine different types of prints |
| 2. | Interpret structural drawings |
| 3. | Evaluate a part from drawing information |
| 4. | Create a sketch or drawing from a specific part assembly or layout |

50-423-712 Fasteners for MMMP Trades (C-3)

# Course Outcome Summary

### Course Information

|  |  |  |
| --- | --- | --- |
|  | Description | Course provides apprentices with a chance to compare fasteners and their uses, analyze fastener failures, and install mechanical fasteners. Formerly module C-3 for related instruction in the MMMP apprenticeship program. |
|  | Total Credits | .25 |
|  | Total Hours | 8 |

### Course Competencies

|  |  |
| --- | --- |
| 1. | Examine and identify different fasteners and their uses |
| 2. | Remove fastener and analyze failures |
| 3. | Install mechanical fasteners |

50-423-713 Precision Measurements for MMMP Trades (C-4)

# Course Outcome Summary

### Course Information

|  |  |  |
| --- | --- | --- |
|  | Description | This course develops apprentice skills in precision measurement.  Types of measuring instruments will be compared and then measuring skills using tapes, steel rules, micrometers, calipers, indicators, and gauges will be developed.  This was formerly the C-4 module in related instruction for the MMMP trade apprenticeship. |
|  | Total Credits | .5 |
|  | Total Hours | 12 |

### Course Competencies

|  |  |
| --- | --- |
| 1. | Examine different types of precision measurement instruments and their uses |
| 2. | Take measurements with tape measures and steel rules |
| 3. | Take measurements with micrometers |
| 4. | Take measurements with calipers |
| 5. | Take measurements with indicators |
| 6. | Take height measurements with various types of gauges |

50-423-714 Rigging for MMMP Trades (C-5)

# Course Outcome Summary

### Course Information

|  |  |  |
| --- | --- | --- |
|  | Description | Apprentices will compare types of rigging equipment and their uses; determine safe loads, rig and crib loads, and move a load with cranes and hoists in this course.  This course was formerly the C-5 module for related instruction in the MMMP apprenticeship. |
|  | Total Credits | 1 |
|  | Total Hours | 32 |

### Course Competencies

|  |  |
| --- | --- |
| 1. | Identify the types of rigging equipment and their uses |
| 2. | Determine the safe working load of rigging equipment |
| 3. | Rig a load |
| 4. | Crib a load |
| 5. | Move a load with an overhead crane |
| 6. | Move a load with a mobile crane |
| 7. | Move a load with a portable hand hoisting/chain fall equipment |

50-423-715 Welding for MMMP Trades (C-6)

# Course Outcome Summary

### Course Information

|  |  |  |
| --- | --- | --- |
|  | Description | Course compares common welding processes and develops apprentice skills related to welding, cutting, heating and using oxy-gas.  Welding with arc, MIG and TIG is included, along with common cutting and joining techniques.  This course was the former C-6 module for the MMMP apprenticeship program. |
|  | Total Credits | .5 |
|  | Total Hours | 10 |

### Course Competencies

|  |  |
| --- | --- |
| 1. | Examine different welding processes |
| 2. | Weld, cut, and heat, using oxy-gas processes |
| 3. | Arc weld metal |
| 4. | Mig weld metal |
| 5. | Tig weld metal |
| 6. | Perform other types of cutting processes |
| 7. | Perform other types of joining processes |

50-423-716 Metallurgy for MMMP Trades (C-7)

# Course Outcome Summary

### Course Information

|  |  |  |
| --- | --- | --- |
|  | Description | This course develops apprentice skills regarding metallurgical concepts.  Apprentices will compare various metals and their applications, apply metallurgical techniques to work processes, test metals for hardness, and examine heat treating applications.  This course is the former C-7 module for the MMMP apprenticeship program. |
|  | Total Credits | .5 |
|  | Total Hours | 10 |

### Course Competencies

|  |  |
| --- | --- |
| 1. | Examine different types of metal and their properties |
| 2. | Examine different metallurgical techniques and their applications |
| 3. | Test metal hardness |
| 4. | Apply different types of heat-treating techniques |

50-423-717 Hydraulics for MMMP Trades (C-8)

# Course Outcome Summary

### Course Information

|  |  |  |
| --- | --- | --- |
|  | Description | This course provides instruction to apprentices concerning many aspects of inspecting, servicing, and troubleshooting hydraulic systems and components. Apprentices will learn safety related issues and be taught proper safety procedures for working with hydraulic systems and components.  It was formerly the C-8 module for the MMMP apprenticeship program. |
|  | Instructional Level | Technical Diploma |
|  | Total Credits | .75 |
|  | Total Hours | 20 |

### Course Competencies

|  |  |
| --- | --- |
| 1. | Define the principles of hydraulics |
| 2. | Interpret hydraulic schematic diagrams |
| 3. | Analyze the function of hydraulic system components |
| 4. | Apply troubleshooting principles to hydraulic systems |
| 5. | Remove construct and install conductors and connectors |
| 6. | Repair hydraulic components |
| 7. | Select hydraulic fluids |
| 8. | Perform preventive maintenance on hydraulic systems |

50-423-718 Pneumatics & Compressed Air for MMMP Trades (C-9)

# Course Outcome Summary

### Course Information

|  |  |  |
| --- | --- | --- |
|  | Description | This course was formerly the C-9 module for the MMMP apprenticeship.  It provides instruction to apprentices concerning many aspects of inspecting, servicing, and troubleshooting pneumatic systems and components. Apprentices will learn safety related issues and be taught proper safety procedures for working with pneumatic systems and components. |
|  | Instructional Level | Technical Diploma |
|  | Total Credits | .75 |
|  | Total Hours | 20 |

### Course Competencies

|  |  |
| --- | --- |
| 1. | Define the principles of pneumatics |
| 2. | Interpret pneumatic schematic diagrams |
| 3. | Analyze the function of pneumatic system components |
| 4. | Service an Filter-Regulator-Lubricator (FRL) unit |
| 5. | Apply troubleshooting principles to pneumatic systems |
| 6. | Service pneumatic conductors and connectors |
| 7. | Repair pneumatic components |
| 8. | Perform preventive maintenance on pneumatic systems |
| 9. | Examine air compressor systems, components and equipment |

50-423-719 Vacuum Systems for MMMP Trades (C-10)

# Course Outcome Summary

### Course Information

|  |  |  |
| --- | --- | --- |
|  | Description | Course introduces principles of vacuum systems and interpreting vacuum system schematics. Apprentices will then develop skills related to installing, repairing, replacing and applying troubleshooting principles to vacuum systems and components. Course examines preventative maintenance techniques commonly used on the job. This course was formerly the C-10 module in related instruction for the MMMP apprenticeship. |
|  | Total Credits | .75 |
|  | Total Hours | 20 |

### Course Competencies

|  |  |
| --- | --- |
| 1. | Define the principles of vacuum systems |
| 2. | Interpret vacuum system schematic diagrams |
| 3. | Install vacuum systems |
| 4. | Apply troubleshooting principles to vacuum systems |
| 5. | Repair and replace vacuum components |
| 6. | Perform preventive maintenance on vacuum systems |

50-423-720 Pipefitting and Valves for MMMP Trades (C-11)

# Course Outcome Summary

### Course Information

|  |  |  |
| --- | --- | --- |
|  | Description | Course introduces apprentices to pipe sizes, materials and schedules, examines fittings, tubing and valves, and develops skills related to layout, installation, and maintenance. This course was formerly the C-11 module for the MMMP apprenticeship program. |
|  | Total Credits | .75 |
|  | Total Hours | 24 |

### Course Competencies

|  |  |
| --- | --- |
| 1. | Examine pipe sizes, materials and schedules |
| 2. | Examine types of pipe fittings |
| 3. | Examine different types of tubing and their related components |
| 4. | Install tubing with fittings |
| 5. | Examine different types of valves and their related components |
| 6. | Layout a piping system |
| 7. | Install a piping system |
| 8. | Maintain piping systems |

50-423-722 Packings, Seals, Gaskets for MMMP Trades (C-13)

# Course Outcome Summary

### Course Information

|  |  |  |
| --- | --- | --- |
|  | Description | Apprentices will examine packing, seals, and gaskets and compare materials and applications.  Then skills in layout, cutting, inspecting, removing, and installing these components will be developed.  This course was the former C-13 module for the MMMP apprenticeship program. |
|  | Total Credits | .5 |
|  | Total Hours | 16 |

### Course Competencies

|  |  |
| --- | --- |
| 1. | Examine types of packing, seals, and gaskets |
| 2. | Examine packing, seal, and gasket materials and applications |
| 3. | Layout and cut gaskets |
| 4. | Inspect packings, seals, and gaskets |
| 5. | Remove packings, seals, and gaskets |
| 6. | Install packings, seals, and gaskets |

50-423-723 SDS & Adhesives and Sealants for MMMP Trades (C-14)

# Course Outcome Summary

### Course Information

|  |  |  |
| --- | --- | --- |
|  | Description | This course was formerly the C-14 module in related instruction for the MMMP apprenticeship. In 2013, based on instructor review, the competencies, performance standards, and learning objectives from the C-14 module was added to this course.  Hours reflect the combined modules. |
|  | Instructional Level | Technical Diploma |
|  | Total Credits | .25 |
|  | Total Hours | 8 |

### Course Competencies

|  |  |
| --- | --- |
| 1. | Examine different adhesive and sealant types and their applications |
| 2. | Apply adhesives to a repair |
| 3. | Apply sealants for repair |
| 4. | Examine SDS safety information for common industrial fluids |
| 5. | Withdraw hazardous materials from containers |

50-423-724 Preventive and Predictive Maintenance for MMMP Trades (C-15)

# Course Outcome Summary

### Course Information

|  |  |  |
| --- | --- | --- |
|  | Description | Course examines both preventative and predictive maintenance concepts as they apply to millwright work processes and machine maintenance.  Apprentices will develop skills related to assessing machine conditions and faults based on both preventative and predictive maintenance.  This course is the former C-15 module in related instruction for the MMMP apprenticeship program. |
|  | Total Credits | 1 |
|  | Total Hours | 36 |

### Course Competencies

|  |  |
| --- | --- |
| 1. | Examine the Preventive Maintenance method |
| 2. | Assess machine conditions and faults from the Preventive Maintenance process |
| 3. | Examine Predictive Maintenance methods |

50-423-726 Green Awareness for the MMMP Trades (C-17)

# Course Outcome Summary

### Course Information

|  |  |  |
| --- | --- | --- |
|  | Description | Green Awareness for the MMMP Trades examines how green projects and sustainable manufacturing initiatives relate to energy efficiency, energy consumption, waste reduction, and changing work processes for the MMMP related trades. Priorities related to cost awareness, energy efficiency, predictive and preventative maintenance, new materials, bearing maintenance, and precision laser alignment are included in this course. Each competency can stand alone and be added to existing modules in the paid related instruction program, or the course can be delivered in its entirety as a new module in the curriculum. Estimated hours shown with each competency are intended to guide educators and employers with planning, and may be modified to meet local needs. Course was formerly the C-17 module in related instruction for the MMMP apprenticeship programs. |
|  | Total Credits | 1 |
|  | Total Hours | 36 |

### Course Competencies

|  |  |
| --- | --- |
| 1. | Be aware of costs, and the business motive for green projects and sustainable manufacturing improvements. (new C-17 module) Estimated time = 4 hours |
| 2. | Analyze energy efficiency initiatives for industrial plants, equipment and facilities. (new C-17 module) Estimated time = 4 hours |
| 3. | Be aware of new materials and options for work processes. (new C-17 module) Estimated time = 4 hours |
| 4. | Relate predictive and preventative maintenance testing procedures to green and sustainable manufacturing principles. (add to C-15 or C-17) Estimated time = 8 hours |
| 5. | Perform precision laser alignment on rotating machines and equipment. (addition to C-15 or C-17) Estimated time = 16 hours |
| 6. | Be aware of bearing maintenance procedures that contribute to reduced costs. (addition to C-17) Estimated time = 4 hours |

50-423-730 Bearings for the MMMP Trades (M-1)

# Course Outcome Summary

### Course Information

|  |  |  |
| --- | --- | --- |
|  | Description | Apprentices will examine bearing types and applications, and compare equipment bearings. Then learners will develop skills related to bearing inspection, selection, removal, mounting, lubrication and diagnosing bearing failures. Course was formerly the M-1 module in related instruction for the MMMP apprenticeship. |
|  | Total Credits | .75 |
|  | Total Hours | 24 |

### Course Competencies

|  |  |
| --- | --- |
| 1. | Examine different bearing types and their applications |
| 2. | Handle equipment bearings |
| 3. | Inspect a bearing |
| 4. | Analyze bearing failures |
| 5. | Remove a bearing |
| 6. | Select a bearing |
| 7. | Mount a bearing |
| 8. | Lubricate a bearing |

50-423-731 Couplings & Alignment for the MMMP Trades (M-2)

# Course Outcome Summary

### Course Information

|  |  |  |
| --- | --- | --- |
|  | Description | Course compares different coupling types and examines common misalignment problems. Apprentices will develop skills related to inspecting, troubleshooting, and preparing couplings for removal and installation, and also aligning and lubricating couplings. This course was formerly the M-2 module for related instruction in the MMMP apprenticeship programs. |
|  | Total Credits | 1 |
|  | Total Hours | 36 |

### Course Competencies

|  |  |
| --- | --- |
| 1. | Examine different coupling types and misalignment |
| 2. | Inspect couplings |
| 3. | Troubleshoot couplings |
| 4. | Prepare for a coupling removal or installation |
| 5. | Align a coupling |
| 6. | Lubricate couplings |

50-423-732 Pumps for the MMMP Trades (M-3)

# Course Outcome Summary

### Course Information

|  |  |  |
| --- | --- | --- |
|  | Description | Course compares different pump types and their applications. Apprentices will complete a field inspection of pumps and learn how to troubleshoot, remove, overhaul, install and perform preventative maintenance on pumps. This course was formerly the M-3 module for related instruction in the MMMP apprenticeship programs. |
|  | Total Credits | .75 |
|  | Total Hours | 24 |

### Course Competencies

|  |  |
| --- | --- |
| 1. | Examine different pump types and their application |
| 2. | Complete a field inspection of pumps |
| 3. | Troubleshoot pumps |
| 4. | Remove a pump |
| 5. | Overhaul a pump |
| 6. | Install a pump |
| 7. | Perform pump preventive maintenance |

50-423-733 Belts, Sheaves, Pulleys and Drives for the MMMP Trades (M-4)

# Course Outcome Summary

### Course Information

|  |  |  |
| --- | --- | --- |
|  | Description | Course compares different belt types and drive components. Apprentices will develop skills related to inspecting, troubleshooting, removing, selecting, and installing belt drive systems. This course was formerly the M-4 module for related instruction in the MMMP apprenticeship programs. |
|  | Total Credits | .75 |
|  | Total Hours | 24 |

### Course Competencies

|  |  |
| --- | --- |
| 1. | Examine different types of belts and their related components |
| 2. | Inspect belt drive systems |
| 3. | Troubleshoot belt drive systems |
| 4. | Remove belt drive components |
| 5. | Select a belt for a belt drive system |
| 6. | Install a belt in a belt drive system |

50-423-734 Gears, Gearboxes, Gear Assemblies for the MMMP Trades (M-5)

# Course Outcome Summary

### Course Information

|  |  |  |
| --- | --- | --- |
|  | Description | Course compares gear types and applications. Apprentices will develop skills inspecting gear assemblies, troubleshooting gear problems, removing gears and components, and reassembling gear drive systems. This course was formerly the M-5 module in related instruction for the MMMP apprenticeship programs. |
|  | Total Credits | .75 |
|  | Total Hours | 24 |

### Course Competencies

|  |  |
| --- | --- |
| 1. | Examine different gear types and their applications |
| 2. | Inspect gear assemblies |
| 3. | Troubleshoot gear and related problems |
| 4. | Remove gears and related drive components |
| 5. | Reassemble gear assemblies |

50-423-735 Mechanical Power Transmission for the MMMP Trades (M-6)

# Course Outcome Summary

### Course Information

|  |  |  |
| --- | --- | --- |
|  | Description | Course examines drive transmission systems and their applications, including roller chains. Apprentices will develop skills inspecting power transmission systems and troubleshooting mechanical drive systems. This course was formerly the M-6 module in related instruction for the MMMP apprenticeship programs. |
|  | Total Credits | .75 |
|  | Total Hours | 24 |

### Course Competencies

|  |  |
| --- | --- |
| 1. | Examine different drive transmission types and their applications |
| 2. | Examine different types of roller chains and their related components |
| 3. | Inspect transmissions and components |
| 4. | Troubleshoot mechanical drive systems |

50-423-736 Conveyors for the MMMP Trades (M-7)

# Course Outcome Summary

### Course Information

|  |  |  |
| --- | --- | --- |
|  | Description | Course examines chain, belt, and other types of conveyors and related components. This course was formerly the M-7 module in related instruction for the MMMP apprenticeship programs. |
|  | Total Credits | .25 |
|  | Total Hours | 8 |

### Course Competencies

|  |  |
| --- | --- |
| 1. | Examine chain conveyors and their related components |
| 2. | Examine belt conveyors and their related components |
| 3. | Examine other conveyor types and their related components |

50-423-737 Equipment Installation for the MMMP Trades (M-8)

# Course Outcome Summary

### Course Information

|  |  |  |
| --- | --- | --- |
|  | Description | Apprentices will layout equipment installations, plan for moving equipment, and set and level equipment. This course was formerly the M-8 module for related instruction in the MMMP apprenticeship programs. |
|  | Total Credits | .75 |
|  | Total Hours | 24 |

### Course Competencies

|  |  |
| --- | --- |
| 1. | Layout equipment installation |
| 2. | Move equipment |
| 3. | Set and level equipment |

50-423-738 Sheet Metal and Structural Steel Fabrication for the MMMP Trades (M-9)

# Course Outcome Summary

### Course Information

|  |  |  |
| --- | --- | --- |
|  | Description | Course compares types of sheet metal and tools used by the trade. Apprentices will develop skills related to fabricating sheet metal and structural steel and then erecting structural steel. This course was formerly the M-9 module in related instruction for the MMMP apprenticeship programs. |
|  | Total Credits | .75 |
|  | Total Hours | 24 |

### Course Competencies

|  |  |
| --- | --- |
| 1. | Examine different types of sheet metal and sheet metal tools |
| 2. | Fabricate using sheet metal |
| 3. | Install fabricated sheet metal |
| 4. | Fabricate using structural steel |
| 5. | Erect structural steel |

47-455-455 Transition to Trainer: Your Role as a Journey Worker

# Course Outcome Summary

### Course Information

|  |  |  |
| --- | --- | --- |
|  | Description | Apprenticeship training is a collaborative partnership: employer and employee associations, government, and educational institutions each play a part. In reality, most learning takes place through the daily interaction between an apprentice and his/her co-workers. Surveys have shown that the apprentices are least satisfied with the on-the-job portion of their training--particularly the ability of journey level workers and supervisors to pass on their knowledge of the trade.   You have already learned to use the tools of your chosen trade. In this workshop you will be introduced to a new set of basic tools--the tools of a jobsite trainer. You will explore the skills that are necessary to be an effective trainer, discover how to deliver hands-on training, and examine the process for giving useful feedback. During the workshop you will build a Training Toolkit to take back to your work on the job. |
|  | Total Hours | 8 |

### Course Competencies

|  |  |
| --- | --- |
| 1. | Value your role as a journey worker trainer |
| 2. | Serve as a mentor and job coach |
| 3. | Foster a positive work environment by acting as an ally/advocate |
| 4. | Provide hands-on skills training |
| 5. | Provide feedback on apprentice performance |