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|  | Manufacturing Occupational Pathway  Youth Apprenticeship  Related Instruction Guide |

# Recommendations

These recommendations are intended to be used by the YA Consortiums when determining appropriate related technical instruction for the youth apprenticeship programs in the Manufacturing cluster. These recommendations are not all-inclusive.

# Related Instruction Credits

The minimum number of related instruction credits for youth apprentices per year is indicated below. Youth apprentices may take more related instruction courses than the minimum required. No matter the options offered for the related instruction, Youth Apprenticeship students must receive high school credit toward graduation.

Options for related instruction include the following. Students must complete one of the options below.

| Course Type | Minimum Number of Credits |
| --- | --- |
| High School Course | 1 high school credit per year |
| College Course | 3 college credits per year |
| Other options: employer provided training, online learning, independent study, etc. | 1 high school credit (options may be combined in various ways but must be equal to one high school credit—the student must receive high school credit toward graduation for this work) |

# Related Instruction options

Related instruction must be provided to all youth apprentices to support the attainment of knowledge necessary to master the competencies. Courses selected for related instruction should be aligned to the competencies identified in the program On-the-Job Learning Performance Standards Guide.

Related courses can be drawn from a variety of options:

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| Type | Description |
| --- | --- |
| Registered Apprenticeship Bridge Courses | Youth apprentices may take courses that are part of the registered apprenticeship at local technical colleges or at other technical colleges online. These courses are excellent options for students because they provide a pathway for the student to seamlessly bridge into the registered apprenticeship having completed some of the required coursework. |
| College Transcripted/Dual Credit Courses | Transcripted credit courses (also referred to as dual credit) provide an opportunity for the student to earn college credit directly from the college. Usually offered through the technical college, these courses may be taught by a technical college instructor or a high school instructor who holds an appropriate credential. Transcripted credit courses are good options because they allow students to earn credit toward a degree at the technical college or sometimes toward related instruction in a registered apprenticeship. |
| High School Courses | High school courses that relate to the apprenticeship job competencies can be used for related instruction. Sometimes these courses can be articulated with the local technical college for advance standing. If the student goes on to take courses at the technical college, advance standing may be awarded for the course based on an articulation agreement between the high school and the college. |
| Other Options | Other options to help students learn related instruction content include:   * Employer provided training * Online courses provided by professional organizations * Independent study courses offered at the local high school   These options can be combined in various ways provided they are related to the competencies in the On-the-Job Learning Performance Standards Guide and meet the minimum number of hours required for one high school credit. |

# Checklist for Course Selection

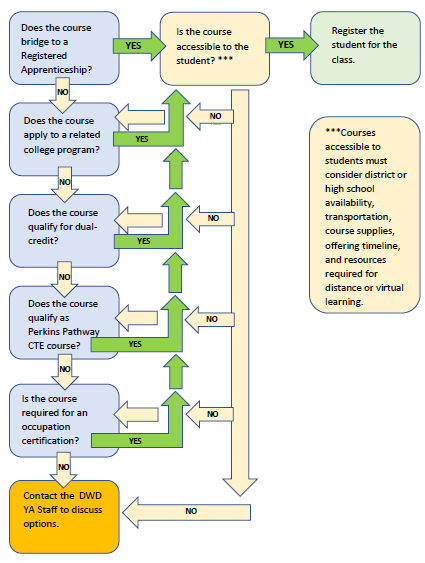
When choosing the courses for a youth apprenticeship using the competencies in the On-the-Job Learning Performance Standards Guide, consider these questions or refer to the decision flowchart.

* Does the course bridge to a registered apprenticeship?
* Does the course apply to a related college program?
* Does the course qualify for dual-credit?
* Does the course qualify as a Perkins Pathway CTE course?
* Is the course required for an occupation certification?

If YES to any above:

* Is the course accessible to the student?  
  *NOTE:* *Course~~s~~ accessibility is determined by district or high school availability, transportation, course supply accessibility, course offering timeline, and distance or virtual learning resources required.*

If NO to any above, contact the DWD YA Staff through the YA mailbox at ([ya@dwd.wisconsin.gov](mailto:ya@dwd.wisconsin.gov)) to discuss options.



# Suggested Related Instruction Courses

The following courses are suggested course topic areas appropriate for manufacturing youth apprentices. These recommendations are not all-inclusive.

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| --- |
| **Course Topic Areas** |
| Metals/Machining |
| Manufacturing |
| Welding |
| Technical Drawing |
| Electronics/Electricity |
| Technical Math and Measuring |

# Opportunities for Registered Apprenticeship Bridge

**CNC Technician:** CNC Technicians set up and operate computer numerically controlled machines to mill, drill, turn, and thread workpieces.

**Electrical and Instrumentation Technician**: Electrical & Instrumentation Technicians install, service, and troubleshoot industrial manufacturing equipment, e.g electrical control systems, motors, programmable controllers, and more.

**Industrial Manufacturing Technician**: Industrial Manufacturing Technicians set up, operate, monitor, and control production equipment. They help improve manufacturing processes and schedules to meet customer requirements, and efficiently and safely manage raw materials.

**Machinist**: Machinists are highly skilled individuals who use machine tools, such as lathes, milling machines, and machining centers, to produce precision machined parts.

**Maintenance Technician**: Maintenance Technicians are highly skilled individuals who safely perform mechanical and electrical duties to keep machines, equipment, or the structure of a facility in repair.

**Millwright**: Millwrights install, maintain, and disassemble industrial machines.

**Tool and Die Maker**: Tool and Die Makers fabricate and repair gauges, jigs, fixtures, and machinist's hand tools, and construct metal forms to shape metal in stamping and forging operations.

**Welder-Fabricator**: Welder-Fabricators weld various metals in various structural shapes, fabricate precision parts and assemblies, cut and trim metal objects using heat, and assemble parts and components.

# Bridged Courses to Registered Apprenticeship

Courses below support the identified registered apprenticeship.

## CNC and Machinist

The following courses bridge to the Machinist Registered Apprenticeship.

| **Number** | **Title** | **Credits** | **Description** |
| --- | --- | --- | --- |
| 50-420-711 | Mathematics for the Machine Trades | 1 | This course provides applied mathematics instruction from a review of basic arithmetic; basic algebra; applications, based on geometry; right triangle trigonometry, oblique angle trigonometry and compound angles. |
| 50-420-715 | Mechanical Hardware & Hand Tools for Machine Trades Apprentices | 1 | This course provides instruction for the apprentice in recognition, selection, and operation of mechanical hardware and hand tools. Apprentices are taught to use outside sources to select correct component or tool sizes, characteristics, and operating parameters. Apprentices will sharpen drills and single point cutting tools. |
| 50-420-713 | Precision Measurement for Machine Tool Trade Apprentices | 1 | This course is designed to acquaint the apprentice with the measurement systems and tools most frequently used in layout and machining processes. Learning outcomes relate to semi-precision through super-precision measuring tools and equipment combined with opportunities to investigate new technologies. |
| 50-420-714 | Engineering Drawings for Machine Trades Apprentices | 1 | This course will acquaint the apprentice with the interpretation of engineering prints and other technical and manufacturing documentation. The primary focus of the course will be on that part of manufacturing most closely related to machining and tooling. Background information is provided relative to the process used to create and finish the product or piece part on the prints being studied. This course was formerly module 4 in related instruction. |
| 50-420-710 | Safety for Machine Trades Apprentices | .25 | Course competencies examine safe work practices for machinists, tool and die makers and related trades.  Apprentices will explore industrial safety standards; personal protective equipment; machine guards and protective devices; MSDS and chemical safety; electrical hazards, and more. Course relates 5S concepts to safe work practices and trade work processes. |

## Electrical and Instrumentation

The following courses bridge to the Electrical and Instrumentation Registered Apprenticeship

| **Number** | **Title** | **Credits** | **Description** |
| --- | --- | --- | --- |
| 50-413-750 | DC Electricity for Industrial Electricians | 2 | This course introduces the fundamental concepts of and computations related to DC electricity. Emphasis is placed on circuit analysis and the problem-solving skills necessary for the maintenance of modern industrial electric systems. Competencies related to metering and safe use of measuring devices are included. |
| 50-413-751 | AC Electricity for Industrial Electricians | 2 | This course is designed to introduce the industrial electrical apprentice to the basic concepts of alternating current. Emphasis is placed on circuit analysis and the problem solving skills necessary for the maintenance of modern industrial electric systems. |
| 50-413-773 | Safety & Print Reading for Industrial Electricians | 0.5 | Advanced electrical, electronic, and trade topics selected by the instructor and trade committee will help prepare apprentices with industry relevant knowledge and skills. Instrumentation is the topic selected for this model. Course competencies include learning about medium voltage electrical systems and the following modules align with the NJATC fifth year core curriculum: • Instrumentation 1 • Instrumentation 2 • Structured Cabling |

## Industrial Manufacturing Technician

## The following courses bridge to the Industrial Manufacturing Technician Registered Apprenticeship.

| **Number** | **Title** | **Credits** | **Description** |
| --- | --- | --- | --- |
| 50-420-510 | Industrial Manufacturing Technician Apprentice 1 | 2.75 | The first semester of related instruction includes an orientation to the trade and manufacturing, then followed by the MSSC safety module, MSSC quality module, OSHA 10 certification, blueprint reading, visual inspection, measurement and first aid & CPR training. Manufacturing concepts will be introduced and applied in a variety of manufacturing settings. MSSC modules 1 and 2 are aligned with the learning plans for this course along with the MATC course Machine Trades Math. |
| 50-420-711 | Mathematics for the Machine Trades | 1 | This course provides applied mathematics instruction from a review of basic arithmetic; basic algebra; applications, based on geometry; right triangle trigonometry, oblique angle trigonometry and compound angles. |

## Bridged Courses to Maintenance Technician Registered Apprenticeship:

The following courses bridge to the Machinist Registered Apprenticeship

| **Number** | **Title** | **Credits** | **Description** |
| --- | --- | --- | --- |
| 50-423-710 | Math and Physics for MMP Trades | 1.0 | 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 MMP Trades | 1.0 | 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. |

## Bridged Courses to Millwright-Pipefitter Registered Apprenticeship:

The following courses bridge to the Machinist Registered Apprenticeship

| **Number** | **Title** | **Credits** | **Description** |
| --- | --- | --- | --- |
| 50-423-710 | Math and Physics for MMP Trades | 1.0 | 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 MMP Trades | 1.0 | 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. |

## Bridged Courses to Welding-Fabricator Registered Apprenticeship:

The following courses bridge to the Machinist Registered Apprenticeship

| **Number** | **Title** | **Credits** | **Description** |
| --- | --- | --- | --- |
| 50-442-51 | Print Reading, Math, Cutting & Inspection | 2.0 | This is the first course in the related instruction portion of the Welder-Fabricator Apprenticeship program. This course introduces the trade, welding and fabrication safety, print reading, trade math, metal cutting, visual inspection, and an orientation to the college and this apprenticeship program. |
| 50-442-522 | Layout & Fabrication Basics with Shielded Metal Arc Welding (SMAW) and Gas Metal Arc Welding (GMAW) | 2.0 | This is the second course in the related instruction portion of the Welder-Fabricator Apprenticeship program. This course introduces fabrication and layout skills and also SMAW and GMAW welding processes. |

## Electromechanical/Mechatronics

The following courses bridge to the Mechatronics Registered Apprenticeship.

| **Number** | **Title** | **Credits** | **Description** |
| --- | --- | --- | --- |
| 50-620-701 | Trade Math Review for Mechatronics Apprentices | 1 | Course competencies include building apprentice skills working with fractions, decimals, formulas and ratios commonly used by the trade. Measurement, tolerances and interpreting trade related information will help apply math concepts to industrial and manufacturing work processes. Basic algebra, geometry and trigonometry will be applied to mechatronics job duties and tasks. Converting between US and metric units is also included.  Course provides a foundation for mechanical and electrical problem-solving involving math. |
| 50-620-702 | Mechatronic Principles | 2 | Course learning outcomes will examine both introductory mechanical & electrical concepts as a foundation for future coursework and on-the-job learning. Troubleshooting principles associated with mechatronics will also be introduced. Apprentices will explore safety, rigging, measurement, mechanical principles, electrical principles, mechanisms, metallurgy, and troubleshooting. |
| 50-620-703 | DC Electricity for Mechatronics | 1 | This course introduces the fundamental concepts and computations related to DC electricity. Emphasis is placed on circuit analysis and the problem-solving skills necessary for the maintenance of mechatronic systems and manufacturing equipment. Competencies related to metering and safe use of measuring devices are included. |
| 50-620-704 | AC Electricity for Mechatronic | 1 | This course is designed to introduce the mechatronic technician apprentice to the basic concepts of alternating current. Emphasis is placed on circuit analysis and the problem-solving skills necessary for the maintenance of mechatronic systems and manufacturing equipment. |
| 50-620-705 | Motors & Motor Control for Mechatronics | 2 | This course examines the fundamentals of electric motors and motor control. Apprentices will learn to recognize and draw basic symbols, use the language of motor control, and apply these in industry adopted formats. Apprentices will also learn to draw and read ladder and wiring diagrams and be introduced to the logic used in motor control.  Learners will apply this logic to correctly interpret, install, service, and wire control circuits. Wiring of panels, machines, and systems will also be examined. |

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