

# Pre-Employment Plan of Training



# PLAN OF TRAINING

## Machinist

June, 2019



**Government of Newfoundland and Labrador  
Department of Advanced Education, Skills and Labour  
Apprenticeship and Trades Certification Division**

Approved by:

A handwritten signature in blue ink that appears to read "Dave L. L." It is written in a cursive style with a blue ink pen.

Chairperson, Provincial Apprenticeship and Certification Board

Date: July 22, 2019

### Preface

This curriculum standard is aligned with the 2018 Red Seal Occupational Standard (RSOS) for the Machinist trade. It describes the curriculum content for the Machinist pre-employment training program.

### Acknowledgements

The Provincial Trade Advisory Committee (PTAC), industry representatives, instructors and apprenticeship staff provided valuable input to the development of this provincial plan of training. Without their dedication to quality apprenticeship training, this document could not have been produced.

We offer a sincere thank you.

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## Plan of Training – Machinist

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| New                    | March 2019           | Pre-Employment<br>September 2019<br><br>Level 2<br>September 2020<br><br>Level 3<br>September 2021<br><br>Level 4<br>September 2022 | Aligns with 2018 RSOS and National Harmonization sequencing |
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### A. RSOS Comparison Table

A Red Seal Occupational Standard (RSOS) comparison chart is located in the Newfoundland and Labrador Curriculum Standard (NLCS) for this trade.

## B. Program Structure

For each and every course, a formal assessment is required for which 70% is the pass mark. A mark of 70% must be attained in both the theory examination and the practical project assignment, where applicable as documented on an official transcript.

The order of course delivery within each level can be determined by the educational agency, as long as pre-requisite conditions are satisfied.

Upon completion of an entry level program, individuals may be required to complete other certifications (employer or job site specific) in order to gain employment.

A pre-employment student who becomes an apprentice will also be required to complete Levels II, III & IV in the Newfoundland and Labrador Curriculum Standard.

| <b>Pre-Employment</b> |                 |   |              |                         |
|-----------------------|-----------------|---|--------------|-------------------------|
| <b>Course No.</b>     | <b>AACS No.</b> | <b>Course Name</b>                      | <b>Hours</b> | <b>Pre-Requisite(s)</b> |
| TS1510                | -               | Occupational Health & Safety            | 6            | None                    |
| TS1520                | -               | WHMIS                                   | 6            | None                    |
| TS1530                | -               | Standard First Aid                      | 14           | None                    |
| MW1190                | -               | Machine Shop Safety                     | 15           | TS1520<br>TS1530        |
| MW1772                | -               | Drawings and Specifications I           | 40           | MW1190                  |
| MW1370                | -               | Basic Layout                            | 15           | MW1190                  |
| MW1381                | -               | Hand and Power Tools                    | 30           | MW1190                  |
| MW1390                | -               | Hand Threading and Reaming              | 30           | MW1190                  |
| MW1782                | -               | Cutting Fluids, Coolants and Lubricants | 15           | MW1190<br>TS1520        |
| MW1762                | -               | Precision Measurement                   | 35           | MW1190<br>MW1370        |
| MW1791                | -               | Machinable Materials                    | 9            | MW1190<br>TS1520        |
| MW1802                | -               | Angular Measurement                     | 30           | MW1762                  |
| MW2301                | -               | Power Sawing Equipment                  | 30           | MW1782                  |
| MW2311                | -               | Introduction to Grinding and Abrasives  | 20           | MW1791                  |
| MW2321                | -               | Heat Treatment I                        | 20           | MW1190<br>MW1791        |

| Pre-Employment |          |   |       |                            |
|----------------|----------|---|-------|----------------------------|
| Course No.     | AACS No. | Course Name   | Hours | Pre-Requisite(s)           |
| MW2370         | -        | Material Testing  | 15    | MW1791<br>MW2321<br>MW2370 |
| MW1841         | -        | Hoisting, Lifting and Rigging   | 15    | MW1190                     |
| MW1852         | -        | Drills and Drill Presses  | 45    | MW1390<br>MW1782<br>MW1791 |
| MW1861         | -        | Introduction to Conventional Lathes                                     | 45    | MW1190                     |
| MW1872         | -        | Basic Conventional Lathe Operation                                      | 70    | MW1190<br>MW1861           |
| MW1881         | -        | Conventional Lathe Drilling, Boring, Reaming, Tapping and Die Threading | 30    | MW1190<br>MW1872           |
| MW1900         | -        | Taper Turning   | 30    | MW1190<br>MW1881           |
| MW1912         | -        | Basic Threading   | 60    | MW1190<br>MW1881           |
| MW1230         | -        | Drawings and Specifications II  | 37    | MW1772                     |
| MW2082         | -        | Mechanical Components   | 15    | MW1190                     |
| MW2123         | -        | Oxy-Fuel Cutting and Welding  | 30    | MW1190                     |
| MW2341         | -        | Reconditioning  | 15    | MW1190                     |
| MW1951         | -        | Reciprocating Machines  | 45    | MW1190                     |
| MW1921         | -        | Introduction to Milling Machines  | 72    | MW1190                     |
| MW2061         | -        | Computer Numerical Control (CNC) Machine Tools                          | 15    | MW1190                     |
| MW2071         | -        | Computer Numerical Control (CNC) Operation 1                            | 45    | MW2061<br>MW1921<br>MW1912 |
| MW1942         | -        | Job Planning  | 25    | MW1190                     |
| MW1945         | -        | Mentoring   | 6     | None                       |
| AM1000         | -        | Introduction to Essential Skills  | 9     | None                       |
| AM1101         | -        | Math Essentials   | 42    | None                       |
| AM1400         | -        | Machinist Math Fundamentals   | 42    | AM1101                     |
| CM2161         | -        | Communication Essentials  | 36    | None                       |

| <b>Pre-Employment</b>      |                 |                                |              |                         |
|----------------------------|-----------------|--------------------------------|--------------|-------------------------|
| <b>Course No.</b>          | <b>AACS No.</b> | <b>Course Name</b>             | <b>Hours</b> | <b>Pre-Requisite(s)</b> |
| SD1761                     | -               | Workplace Essentials           | 24           | None                    |
| MC1062                     | -               | Computer Essentials            | 15           | None                    |
| AP1102                     | -               | Introduction to Apprenticeship | 12           | None                    |
| Total Pre-Employment Hours |                 |                                | <b>1110</b>  |                         |

\*A student who can meet the mathematics requirement through an ACUPLACER® test may be exempted from AM1101 - Math Essentials. Please check with your training institution.

### **Required Work Experience**

## Pre-Employment

### TS1510 Occupational Health and Safety

#### **Learning Outcomes:**

- Demonstrate knowledge of how to prevent accidents and illnesses.
- Demonstrate knowledge of how to improve health and safety conditions in the workplace.

**Duration:** 6 Hours

**Pre-Requisite(s):** None

#### **Objectives and Content:**

1. Interpret the Occupational Health and Safety Act laws and regulations.
  - i. explain the scope of the act
    - application of the Act
    - Federal/Provincial jurisdictions
    - Canada Labour Code
    - rules and regulations
    - private home application
    - conformity of the Crown by the Act
2. Explain responsibilities under the Act and Regulations.
  - i. duties of employer, owner, contractors, sub-contractors, employees, and suppliers
3. Explain the purpose of joint health and safety committees.
  - i. formation of committee
  - ii. functions of committee
  - iii. legislated rights
  - iv. health and safety representation
  - v. reporting endangerment to health
  - vi. appropriate remedial action
  - vii. investigation of endangerment
  - viii. committee recommendation
  - ix. employer's responsibility in taking remedial action
4. Examine right to refuse dangerous work.
  - i. reasonable grounds for refusal
  - ii. reporting endangerment to health
  - iii. appropriate remedial action
  - iv. investigation of endangerment

- v. committee recommendation
- vi. employer's responsibility to take appropriate remedial action
- vii. action taken when employee does not have reasonable grounds for refusing dangerous work
- viii. employee's rights
- ix. assigning another employee to perform duties
- x. temporary reassignment of employee to perform other duties
- xi. collective agreement influences
- xii. wages and benefits

5. State examples of work situations where one might refuse work.

6. Describe discriminatory action.

- i. definition
- ii. filing a complaint procedure
- iii. allocated period of time a complaint can be filed with the Commission
- iv. duties of an arbitrator under the Labour Relations Act
- v. order in writing inclusion
- vi. report to commission allocated period of time to request arbitrator to deal with the matter of the request
- vii. notice of application
- viii. failure to comply with the terms of an order
- ix. order filed in the court

7. Explain duties of commission officers.

- i. powers and duties of officers
- ii. procedure for examinations and inspections
- iii. orders given by officers orally or in writing
- iv. specifications of an order given by an officer to owner of the place of employment, employer, contractor, sub-contractor, employee, or supplier
- v. service of an order
- vi. prohibition of persons towards an officer in the exercise of his/her power or duties
- vii. rescinding of an order
- viii. posting a copy of the order
- ix. illegal removal of an order

8. Interpret appeals of others.

- i. allocated period of time for appeal of an order
- ii. person who may appeal order
- iii. action taken by commission when person involved does not comply with the order
- iv. enforcement of the order
- v. notice of application
- vi. rules of court

9. Explain the process for reporting of accidents.
  - i. application of act
  - ii. report procedure
  - iii. reporting notification of injury
  - iv. reporting accidental explosion or exposure
  - v. posting of act and regulations

**Practical Requirements:**

1. Conduct an interview with someone in your occupation on two or more aspects of the act and report results.
2. Conduct a safety inspection of shop area.

## TS1520 Workplace Hazardous Materials Information System (WHMIS)

### **Learning Outcomes:**

- Demonstrate knowledge of interpreting and applying the Workplace Hazardous Materials Information System (WHMIS) regulation under the Occupational Health and Safety Act.

**Duration:** 6 Hours

**Pre-Requisite(s):** None

### **Objectives and Content:**

1. Define WHMIS safety.
  - i. rational and key elements
  - ii. history and development of WHMIS
  - iii. WHMIS legislation
  - iv. WHMIS implementation program
  - v. definitions of legal and technical terms
2. Examine hazard identification and ingredient disclosure.
  - i. prohibited, restricted and controlled products
  - ii. classification and the application of WHMIS information requirements
  - iii. responsibilities for classification
    - the supplier
    - the employer
    - the worker - Classification: rules and criteria
    - information on classification
    - classes, divisions and subdivision in WHMIS
    - general rules for classification
    - class A - compressed gases
    - class B - flammable and combustible materials
    - class C - oxidizing material
    - class D - poisonous and infectious material
    - class E - corrosive material
    - class F - dangerously reactive material
  - iv. products excluded from the application of WHMIS legislation
    - consumer products
    - explosives
    - cosmetics, drugs, foods and devices
    - pest control products
    - radioactive prescribed substances
    - wood or products made of wood
    - manufactured articles

- tobacco or products of tobacco
- hazardous wastes
- products handled or transported pursuant to the Transportation of Dangerous Goods (TDG) Act
- v. comparison of classification systems – WHMIS and TDG
- vi. general comparison of classification categories
- vii. detailed comparison of classified criteria

3. Explain labeling and other forms of warning.

- i. definition of a WHMIS label
  - supplier label
  - workplace label
  - other means of identification
- ii. responsibility for labels
  - supplier responsibility
  - employer responsibility
  - worker responsibility
- iii. introduce label content, design and location
  - supplier labels
  - workplace labels
  - other means of identification

4. Introduce material safety data sheets (MSDS).

- i. definition of a material safety data sheet
- ii. purpose of the data sheet
- iii. responsibility for the production and availability of data sheets
  - supplier responsibility
  - employer responsibility
  - workers responsibility

**Practical Requirements:**

1. Locate WHMIS label and interpret the information displayed.
2. Locate a MSDS sheet for a product used in the workplace and determine what personal protective equipment and other precautions are required when handling this product.

**TS1530      Standard First Aid**

**Learning Outcomes:**

- Demonstrate knowledge of recognizing situations requiring emergency action.
- Demonstrate knowledge of making appropriate decisions concerning first aid.

**Duration:**      14 Hours

**Pre-Requisites:**      None

**Objectives and Content:**

1. Complete a **St. John Ambulance or Canadian Red Cross** Standard First Aid Certificate course.

## MW1190 Machine Shop Safety

### **Learning Outcomes:**

- Demonstrate knowledge of PPE and safety equipment, their applications, maintenance and procedures for use.
- Demonstrate knowledge of safe work practices.
- Demonstrate knowledge of regulatory requirements pertaining to safety.

**Duration:** 15 Hours

**Pre-Requisite(s):** TS1520, TS1530

### **Objectives and Content:**

1. Identify types of personal protective equipment (PPE) and safety equipment and describe their applications.
  - i. vision
  - ii. hearing
  - iii. clothing
  - iv. footwear
  - v. respiratory
2. Describe the procedures used to care for and maintain PPE and safety equipment.
3. Identify types of fire extinguishing equipment and describe their applications and procedures for use.
4. Explain fire regulations.
  - i. alarms and evacuation procedures
  - ii. fire exits
  - iii. extinguishers
5. Identify workplace hazards and describe safe work practices.
  - i. shop/facility
    - energy state awareness
    - electrical and mechanical
  - ii. lock-out/tag-out
  - iii. ventilation/fumes
  - iv. fire
  - v. environment
    - discharge/spills
    - material waste
  - vi. personal
  - vii. shop/facility

- energy state awareness (electrical and mechanical )
- lockout / tag out
- ventilation/fumes
- fire

viii. environment

ix. discharge/spills

6. Identify and follow workplace safety and health regulations.

- i. WHMIS
- ii. provincial/territorial OH&S

7. Explain the importance of conducting safety inspections of shops.

**Practical Requirements:**

1. Perform a safety inspection of the machine shop.
2. Class discussion on the findings of a safety inspection.

## MW1772 Drawings and Specifications I

### **Learning Outcomes:**

- Demonstrate knowledge of drawings and their applications.
- Demonstrate knowledge of interpreting and extracting information from drawing features.
- Demonstrate knowledge of reference materials and their use.
- Demonstrate knowledge of calculations.
- Demonstrate knowledge of sketching and its application.
- Demonstrate knowledge of industry symbols and markings and their applications.
- Demonstrate knowledge of geometric dimensions and tolerances and their applications.

**Duration:** 40 Hours

**Pre-Requisite(s):** MW1190

### **Objectives and Content:**

1. Define terminology associated with drawings.
  - i. engineering
  - ii. isometric
  - iii. orthographic
2. Identify types of drawings and sketches and describe their purpose.
3. Interpret and extract information from drawing features.
  - i. line types
  - ii. projections
  - iii. dimensions
  - iv. notes
4. Explain the principles of orthographic projection.
5. Identify types of reference materials and their use.
  - i. Machinery's Handbook
  - ii. material data sheets
  - iii. manufacturers' specifications
6. Identify information from reference materials and determine the calculations.

7. Identify drawing views and describe their characteristics, purpose and applications.
  - i. isometric
  - ii. orthographic
8. Identify and interpret industry symbols and markings and describe their applications.
  - i. hidden (phantom) lines
  - ii. datums
9. Identify types of sketches and describe their purpose.
10. Describe basic sketching techniques and types of views.
11. Identify dimensions used in creating sketches.
12. Describe how to interpret and extract information from parts to create a sketch.

**Practical Requirements:**

1. Demonstrate an accurate reading and transfer of sizes from physical measurements to create an accurate drawing.
2. Demonstrate the ability to read and interpret basic drawings and transfer information to the work piece.
3. Prepare and dimension basic freehand sketches of mechanical components and assemblies.
4. Determine dimensions.
5. Identify tolerances.

## MW1370 Basic Layout

### **Learning Outcome:**

- Demonstrate knowledge of basic layout and its application.
- Demonstrate knowledge of basic layout tools and equipment, their applications, maintenance and procedures for use.
- Demonstrate knowledge of the procedures used to perform a basic layout.
- Demonstrate knowledge of methods used to mark stock and workpieces.

**Duration:** 15 Hours

**Pre-Requisite(s):** MW1190

### **Objectives and Content:**

1. Define terminology associated with basic layout.
2. Identify types of basic layout tools, equipment and accessories and describe their applications and procedures for use.
  - i. surface tables
  - ii. angle plates
  - iii. scribes
  - iv. dividers and trammels
  - v. hermaphrodite calipers
  - vi. squares (adjustable, solid, master)
  - vii. gauges
  - viii. rulers
  - ix. layout dye
  - x. prick punches
  - xi. centre punch
  - xii. automatic centre punch
  - xiii. layout tables
  - xiv. surface plates
  - xv. combination set
  - xvi. surface gauges
  - xvii. calipers (inside and outside)
  - xviii. parallels
  - xix. v-blocks
3. Identify types of layout media/solutions and describe their applications.
4. Describe the procedure to calculate layout dimensions and reference points.
5. Describe the procedures used to read and transfer sizes from a drawing.

6. Describe the procedures used to perform a basic layout.
7. Identify methods used to mark stock and workpieces for identification.
8. Describe the procedures used to inspect, maintain and store layout tools and equipment.
9. Describe datum or reference surfaces, their purpose and applications.
10. Describe the procedures used to perform accurate layout of work on a flat surface.

**Practical Requirements:**

1. Select and apply layout coatings.
2. Layout work from blueprints.
3. Perform basic layout procedure to an accuracy of 1/64 inch.

## MW1381 Hand and Power Tools

### **Learning Outcomes:**

- Demonstrate knowledge of hand tools, their applications, maintenance and procedures for use.
- Demonstrate knowledge of power tools, their applications, maintenance and procedures for use.
- Demonstrate knowledge of hand saws, their applications, maintenance and procedures for use.
- Demonstrate knowledge of deburring, the hand and power tools for deburring and the techniques used.
- Demonstrate knowledge of filing tools, their applications, maintenance and procedures for use.
- Demonstrate knowledge of safe work practices and procedures.

**Duration:** 30 Hours

**Pre-Requisite(s):** MW1190

### **Objectives and Content:**

1. Identify hazards and describe safe work practices pertaining to hand and power tools.

#### Hand Tools

2. Identify types of hand tools and describe their applications and procedures for use.
  - i. vises
    - parts
    - sizing methods
    - mounting procedures
    - work holding methods
  - ii. hammers
  - iii. screw drivers
  - iv. wrenches
    - metric and imperial sizing systems
  - v. pliers
  - vi. punches
    - dressing procedures
  - vii. stamps
    - parts
  - viii. hacksaws

- parts
- ix. files
- x. scrapers
- xi. deburring tools

3. Describe the procedures used to inspect, maintain and store hand tools.
4. Identify types of power tools and equipment and describe their applications and procedures for use.
  - i. electrical
    - portable bandsaw
    - hand grinders
  - ii. cordless
    - drill
    - reciprocating saw
    - circular saw
  - iii. hydraulic
    - press
  - iv. pneumatic
    - die grinder
    - blow gun
5. Describe the procedures used to inspect, maintain and store power tools and equipment.
6. Define terminology associated with hands saws.
7. Identify types of sawing operations and describe their associated procedures.
8. Identify types of blades and describe their parameters, applications and installation procedures.
9. Identify potential problems during sawing operations and describe their causes and solutions.
10. Identify hazards and describe safe work practices pertaining to hand saws.
11. Identify features to be deburred.
12. Identify hand and power tools for deburring.
  - i. files
  - ii. die grinders and accessories

13. Identify types of filing tools and describe their applications and procedures for use.
  - i. single cut
  - ii. double cut
  - iii. needle files
  - iv. handle
  - v. file card
14. Describe the procedures used to inspect, maintain and store filing tools.
15. Identify hazards and describe safe work practices pertaining to filing tools.

**Practical Requirements:**

1. Use various hand tools.
2. Draw file a flat surface.
3. Cut various materials using a hacksaw.
4. Select various power tools for various applications.

## MW1390 Hand Threading and Reaming

### **Learning Outcomes:**

- Demonstrate knowledge of basic threads and fits and their applications.
- Demonstrate knowledge of the procedures used to measure and gauge threads.
- Demonstrate knowledge of thread inserts and their applications.
- Demonstrate knowledge of procedures used to produce and restore internal and external threads.
- Demonstrate knowledge of safe work practices and procedures.

**Duration:** 30 Hours

**Pre-Requisite(s):** MW1190

### **Objectives and Content:**

1. Define terminology associated with threads.
2. Identify hazards and describe safe work practices pertaining to threading.
3. Identify types of threads and describe their purpose and applications.
4. Explain thread fit, classifications and series.
5. Identify types of thread inserts and describe their applications and installation procedures.
6. Describe the importance of thread fit and the use of thread gauges.
7. Identify types of thread failures and describe their causes and solutions.
8. Calculate and select tap drill sizes in metric and imperial.
9. Identify methods used to measure and gauge threads and describe their associated procedures.

### Taps and Dies

10. Describe the procedures used to produce threads using taps and dies.
11. Identify types of taps and dies and describe their applications and procedures for use.
12. Describe the procedure to extract broken taps.

13. Describe the different thread types.
14. Describe tap failures and remedies.
15. Describe the function of lubricants and the importance of selecting the lubricant.
16. Describe the different types of imperial and metric dies, their applications and use.
17. Describe the procedures used to restore threads with taps and dies.
18. Describe the procedures used to calculate tap drill sizes.

#### Hand Reamers

19. Identify reamers and describe their characteristics and applications.
  - i. maintenance
  - ii. storage
20. Describe the procedures used to perform hand reaming.

#### **Practical Requirements:**

1. Thread studs using dies.
2. Restore internal threads with a tap.
3. Hand ream a hole.

## MW1782 Cutting Fluids, Coolants and Lubricants

### **Learning Outcomes:**

- Demonstrate knowledge of cutting fluids, their applications, and procedures for use.
- Demonstrate knowledge of coolants, their applications, and procedures for use.
- Demonstrate knowledge of lubricants, their applications and procedures for use.
- Demonstrate knowledge of solvents, their applications, and procedures for use.
- Demonstrate knowledge of cleaning agents, their applications, and procedures for use.

**Duration:** 15 Hours

**Pre-Requisite(s):** MW1190, TS1520

### **Objectives and Content:**

1. Define terminology associated with cutting fluids and coolants.
2. Identify hazards and describe safe work practices pertaining to cutting fluids, and coolants.
  - i. personal
  - ii. shop/facility
  - iii. environmental
3. Describe regulations pertaining to the use of cutting fluids and coolants.
4. Interpret codes and regulations pertaining to the use of fluids and coolants.
5. Identify types of fluids and coolants and describe their purpose, characteristics and applications.
  - i. cutting fluids
  - ii. coolants
  - iii. lubricants
  - iv. solvents
6. Describe the types of friction and their implications.
  - i. sliding friction
  - ii. rolling friction
  - iii. fluid friction

7. Describe the procedures used to handle, store and dispose of fluids and coolants.
  - i. cutting fluids
  - ii. coolants
  - iii. lubricants
  - iv. solvents
8. Identify cleaning agents used to clean machines.
9. Describe process to clean machines.
10. Describe the application of cleaning agents.

### Lubricants

11. Identify types of lubricants and describe their applications and procedures for use.
  - i. hand oiler
  - ii. wick feed
  - iii. drip feed
  - iv. slinger
  - v. splash
  - vi. pressure system
  - vii. oil mist
  - viii. grease nipples and cups
12. Describe the principles, purposes and importance of lubricants.
13. Describe the procedures used to select, apply and maintain lubricants.
14. Describe the procedures used to handle, store and dispose of lubricants.

### **Practical Requirements:**

1. Clean and lubricate instruments and machinery.
2. Identify, select and mix cutting fluids.

## MW1762 Precision Measurement

### **Learning Outcomes:**

- Demonstrate knowledge of basic precision measurement and its use.
- Demonstrate knowledge of precision measuring instruments, their applications and procedures for use.
- Demonstrate knowledge of precision measuring equipment and its use.
- Demonstrate knowledge of quality inspection and its use.

**Duration:** 35 Hours

**Pre-Requisite(s):** MW1190, MW1370

### **Objectives and Content:**

#### Applied Mathematics

1. Describe the procedure to perform accurate mathematical calculations using fractions.
2. Describe the procedure to perform calculations and conversions using the metric and imperial systems.
3. Interpret measurements using metric and imperial systems.

#### Basic Measurement

4. Define terminology associated with basic precision measurement.
5. Describe the imperial and metric measuring systems and the procedures used to perform conversions for machining operations.
6. Describe the procedures used to read basic precision measuring instrument scales.

7. Identify types of precision measuring instruments and describe their applications and procedures for use.
  - i. micrometers
  - ii. Vernier calipers
  - iii. dial indicators
  - iv. radius gauges
  - v. combination sets
  - vi. plug gauges
  - vii. tool makers' buttons
  - viii. telescopic gauges
  - ix. feeler gauges
  - x. go-no go gauges
  - xi. wiggler
  - xii. angle gauges
  - xiii. small hole gauges
  - xiv. solid square
  - xv. thread gauges
  - xvi. spring and firm-joint calipers
  - xvii. depth and height gauges
  - xviii. steel rules
  - xix. machinist levels
  - xx. master height gauge
8. Identify types of micrometers and describe their characteristics, applications, and procedures for use.
  - i. adjustment
  - ii. care and maintenance
9. Describe the procedures used to perform basic calibration of measuring instruments.
10. Describe procedures used to inspect, clean, maintain and store basic precision measuring instruments.
11. Identify types of squares and describe their applications and procedures for use.

**Practical Requirements:**

1. Perform micrometer adjustments, proper care and storage of micrometers.
2. Perform correct transfer of sizes.
3. Perform measurement of height and depth to an accuracy of .001 inch using a Vernier height gauge.
4. Perform accurate measurements using a variety of measuring instruments (internal, external, height).

## MW1791 Machinable Materials

### **Learning Outcomes:**

- Demonstrate knowledge of materials, their applications and procedures for use.
- Demonstrate knowledge of metals and their characteristics.
- Demonstrate knowledge of specialty machinable materials.

**Duration:** 9 Hours

**Pre-Requisite(s):** MW1190, TS1520

### **Objectives and Content:**

1. Define terminology associated with machinable materials.
2. Identify hazards and describe safe work practices pertaining to machining materials.
3. Describe the properties of materials and their chemical, physical and mechanical characteristics.
4. Describe the procedures used to determine the carbon content of metal.
5. Identify and interpret markings and documentation relating to material selection and identification systems.
  - i. American Society of Mechanical Engineers (ASME)
  - ii. American National Standards Institute (ANSI)
  - iii. Society of Automotive Engineers (SAE)
  - iv. colour coding (manufacturer specific)
  - v. numbering system
  - vi. mill certificates
6. Identify types of machinable materials and describe their characteristics and applications.
  - i. metallic
    - ferrous
    - non-ferrous
  - ii. non-metallic
  - iii. specialty
    - alloys
    - refractory metals
    - precious metals
7. Explain the processing characteristics of materials.

8. Identify types of coolants used with machinable materials and describe the considerations affecting their selection.
9. Explain the operating principles of machining materials.
  - i. metallic
  - ii. non-metallic
  - iii. specialty
10. Describe the procedures used to set up and machine materials.

#### Non-Metallic Materials

11. Identify non-metallic materials and describe their characteristics and applications.
12. Describe hazards and safety precautions involved in machining non-metallic materials.
13. Describe the principles and procedures for machining non-metallic materials.
14. Describe the procedures used to mark work pieces for identification.

#### **Practical Requirements:**

1. None.

## MW1802 Angular Measurement

### **Learning Outcomes:**

- Demonstrate knowledge of gauge blocks, their applications and procedures for use.
- Demonstrate knowledge of angular measurement and its use.

**Duration:** 30 Hours

**Pre-Requisite(s):** MW1762

### **Objectives and Content:**

1. Describe the procedure to perform calculations for angular measurements using sine, cosine and tangents.
2. Identify types and grades of gauge blocks and describe their applications and procedures for use.
  - i. metric
  - ii. imperial
  - iii. purpose
  - iv. grades
  - v. tolerance
  - vi. accuracy
  - vii. materials
  - viii. set sizes and number of blocks
3. Identify pin and ball gauge sets.
4. Identify height build-ups and describe their applications and procedures for use.
  - i. calculations
5. Identify types of wear blocks and describe their purpose and applications.
6. Describe the factors that affect gauge blocks and their impact.
  - i. temperature
  - ii. contaminants
  - iii. maintenance
  - iv. applications
  - v. calculations
7. Identify types of precision measuring equipment used in quality inspection and describe their applications and procedures for use.

8. Explain the principles of angular measurement.
  - i. angle gauge blocks
9. Identify precision layout tools and equipment and describe their applications and procedures for use.
  - i. universal bevel protractor
  - ii. sine bar
  - iii. gauge blocks
  - iv. sine plate
  - v. surface plate
10. Identify sine bars and describe their applications and procedures for use.
11. Identify compound sine plates and describe their applications and procedures for use.

**Practical Requirements:**

1. Perform gauge block build ups to check the accuracy of an angle using a dial indicator.
2. Read a Vernier protractor to perform angular measurement.
3. Perform calculations to achieve required angles using gauge blocks and a sine bar.
4. Perform measurement using angle gauge blocks.

## MW2301 Power Sawing Equipment

### **Learning Outcomes:**

- Demonstrate knowledge of power saws, their applications, maintenance and safe procedures for use.
- Demonstrate knowledge of saw blades, their applications, maintenance and procedures for use.
- Demonstrate knowledge of safe work practices and procedures related to the use of power saws.

**Duration:** 30 Hours

**Pre-Requisite(s):** MW1782

### **Objectives and Content:**

1. Define terminology associated with power saws.
2. Identify hazards and describe safe work practices pertaining to power saws and saw blades.
3. Identify types of power saws and attachments and describe their applications.
  - i. vertical
  - ii. horizontal
  - iii. reciprocating/power hacksaws
  - iv. cold circular
  - v. abrasive
  - vi. cutoff
  - vii. contour
  - viii. friction
  - ix. hacksaw
  - x. rip fence
  - xi. protective devices
  - xii. saw guide selection
  - xiii. power feed
  - xiv. work holding devices
4. Identify types of accessories and components and describe their characteristics and applications.
5. Identify size and capacity of power saw.

6. Identify types of sawing operations and describe their associated procedures.
  - i. contour
    - internal and external contour sawing
    - notching and slotting
    - radius cutting and splitting
  - ii. angular cutting
  - iii. stock cutting
7. Identify types of blades and describe their parameters, characteristics, applications and installation procedures.
  - i. composition
  - ii. sizing
  - iii. bandsaw length calculations
  - iv. teeth
  - v. pitch
8. Describe the procedures used to adjust power saws.
9. Describe the procedures used to adjust a saw blade.
10. Identify potential problems during sawing operations and describe their causes and remedies.
  - i. incorrect speeds and feeds
  - ii. binding and overheating blade
  - iii. wandering
11. Identify potential problem when cutting irregular shapes and describe their causes and solutions.
  - i. incorrect speeds and feeds
  - ii. binding and overheating blade
  - iii. incorrect pitch of blade
  - iv. lack of lubrication
12. Calculate speed and feed requirements.
  - i. factors
  - ii. tables and charts
13. Describe the procedures used to adjust speeds and feeds.
14. Describe preventive maintenance procedures for sawing equipment.
  - i. care
  - ii. storage
  - iii. blade welding
15. Describe the procedures used to inspect and maintain power saws.

16. Describe the procedures used to butt weld bandsaw blades.
17. Describe the procedures used to secure workpiece on power saws.
18. Describe the procedures used to adjust table angle.
19. Describe the procedures to calculate and measure workpiece to be cut.

**Practical Requirements:**

1. Cut work accurately with power saws.
  - i. vertical bandsaw
  - ii. horizontal bandsaw
  - iii. abrasive cutoff saw
2. Select and install bandsaw blades.
3. Adjust work rests and guards.
4. Weld band saw blade to calculated length.

## MW2311 Introduction to Grinding and Abrasives

- Demonstrate knowledge of off-hand grinding machines, their applications, and procedures for use.
- Demonstrate knowledge of abrasives, their applications and procedures for use.
- Demonstrate knowledge of abrasive finishing techniques.
- Demonstrate knowledge of safe work practices and procedures.

**Duration:** 20 Hours

**Pre-Requisite(s):** MW1791

### **Objectives and Content:**

#### Grinding Machines

1. Define terminology associated with off-hand grinding machine.
2. Identify hazards and describe safe work practices pertaining offhand grinding machines.
3. Identify types of grinding machines and describe their applications.
  - i. pedestal
  - ii. surface
  - iii. cylindrical
  - iv. centreless
  - v. tool and cutter grinder
  - vi. die grinders
  - vii. angle grinders
4. Describe the procedures used to perform offhand (bench) grinding operations.
5. Describe the procedures used to perform tool grinding operations on a carbide tool grinder.
6. Describe grinding wheels, their characteristics and applications.
  - i. wire wheels and buffers
  - ii. grinding disks
  - iii. sanding disks
  - iv. flap wheels
  - v. rotary burrs
  - vi. mounted points
  - vii. loose abrasives
  - viii. abrasives

7. Describe safety procedures and operating precautions related to grinding.
  - i. speed
  - ii. rests and guards
  - iii. ring testing
  - iv. machine condition
  - v. dressing of wheels
  - vi. wheel blotters
8. Describe types of hand dressers, their characteristics applications and procedures for use.
  - i. abrasive stick
  - ii. mechanical dressers (starwheel)
9. Describe the procedures used to test and mount a grinding wheel.
10. Describe the procedures used to dress a grinding wheel by hand.

### Abrasives

11. Define terminology associated with abrasives.
12. Identify hazards and describe safe work practices related to abrasives.
13. Identify types of abrasives and describe their characteristics and applications.
  - i. aluminum oxide
  - ii. silicon carbide
  - iii. zirconia-aluminum oxide
  - iv. boron carbide
  - v. ceramic aluminum oxide
  - vi. diamond
14. Identify coated abrasives and describe their characteristics, construction and applications.
15. Describe the types of manufactured diamond and their characteristics.
16. Describe the procedures used to shape or finish a workpiece using abrasive techniques.
17. Identify types of materials and equipment used to lap and hone workpieces.
18. Identify lapping and honing techniques and describe their associated procedures.
19. Identify types of materials and equipment used to buff and polish workpieces.

20. Identify polishing and blending techniques and describe their associated procedures.

**Practical Requirements:**

1. Ring test, mount grinding wheel, set guards and dress wheel.

## MW2321 Heat Treatment I

### **Learning Outcomes:**

- Demonstrate knowledge of basic heat treatment and its applications.

**Duration:** 20 Hours

**Pre-Requisite(s):** MW1190, MW1791

### **Objectives and Content:**

1. Define terminology associated with heat treatment.
2. Identify hazards and describe safe work practices pertaining to heat treatment.
3. Identify methods used to determine the carbon content of steels.
4. Describe the factors affecting the selection of tool steels.
5. Identify methods used for quenching steel and describe the properties of the steel produced by each.
  - i. water hardening
  - ii. oil hardening
  - iii. air hardening
  - iv. case hardening
6. Identify methods used to heat treat metals and describe their associated procedures and equipment.
  - i. flame
  - ii. furnace/oven
  - iii. induction

### **Practical Requirements**

1. Heat treat a workpiece.
2. Perform hardness test for metals.

## MW2370 Material Testing

### **Learning Outcomes:**

- Demonstrate knowledge of basic material testing and its applications and procedures.
- Demonstrate knowledge of material testing procedures.
- Demonstrate knowledge of quality inspection and its use.

**Duration:** 15 Hours

**Pre-Requisite(s):** MW1791, MW2321

### **Objectives and Content:**

1. Define terminology associated with material testing.
  - i. hardness
  - ii. composition
  - iii. properties
2. Identify hazards and describe safe work practices pertaining to material testing.
3. Identify types of tests performed on materials and describe their applications.
  - i. destructive
    - tensile strength
    - impact
  - ii. non-destructive
    - x-ray
    - dye penetrant/liquid penetrant
  - iii. magnetic particle
  - iv. spark
  - v. file
4. Identify the machines and scales used to determine material hardness and describe their associated procedures.
  - i. Rockwell
  - ii. Brinell
  - iii. Scleroscope
5. Describe the procedures used to test steels.
  - i. tensile strength test
  - ii. impact test
  - iii. spark test
  - iv. file test

**Practical Requirements:**

1. Perform file and spark test.
2. Perform the procedure for testing metals.

## MW1841 Hoisting, Lifting and Rigging

### **Learning Outcomes:**

- Demonstrate knowledge of hoisting, lifting and rigging equipment, their applications, limitations and procedures for use.
- Demonstrate knowledge of hoisting, lifting and rigging techniques.

**Duration:** 15 Hours

**Pre-Requisite(s):** MW1190

### **Objectives and Content:**

1. Define terminology associated with hoisting, lifting and rigging.
2. Identify hazards and describe safe work practices pertaining to hoisting, lifting and rigging.
3. Identify codes and regulations pertaining to hoisting, lifting and rigging training and certification requirements.
4. Identify and interpret basic hand signals used for hoisting and lifting.
5. Identify types of hoisting and lifting equipment and accessories and describe their applications, limitations and procedures for use.
  - i. rigging equipment
    - ropes
    - slings
    - chains
    - hooks
    - spreader bars
    - shackles
6. Explain angle considerations when using rigging.
  - i. rigging charts
  - ii. rule of thumb formula
  - iii. compensation for angles in lifting of loads
7. Describe the considerations when rigging material/equipment for lifting.

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- i. equipment and accessories
- ii. anchor points

8. Describe the procedures used to inspect, maintain and store hoisting, lifting and rigging equipment.

### **Practical Requirements:**

None.

## MW1852 Drills and Drill Presses

### **Learning Outcomes:**

- Demonstrate knowledge of drill press tooling and drill presses, their applications, maintenance and procedures for use.
- Demonstrate knowledge of drilling, reaming and countersink operations.
- Demonstrate knowledge of jigs, fixtures and work holding devices, their applications, maintenance and procedures for use.
- Demonstrate knowledge of measurements and calculations pertaining to drilling operations.
- Demonstrate knowledge of measurements and calculations pertaining to countersinks, counterbores, chamfers and spot faces.
- Demonstrate knowledge of drill press tapping tools, their applications, maintenance and procedures for use.
- Demonstrate knowledge of hole finishing tooling, their applications, maintenance and procedures for use.
- Demonstrate knowledge of measurements pertaining to hole finishing operations.
- Demonstrate knowledge of calculations pertaining to hole finishing operations.
- Demonstrate knowledge of safe work practices and procedures.

**Duration:** 45 Hours

**Pre-Requisite(s):** MW1390, MW1782, MW1791

### **Objectives and Content:**

1. Define terminology associated with drill press tooling and drill presses.
2. Define terminology associated with dress press tapping tooling.
  - i. tapping heads
  - ii. collets
  - iii. chucks
  - iv. cutting and forming taps
  - v. countersinks
3. Identify types of drill press tapping tools and describe their applications.
4. Identify hazards and describe safe work practices pertaining to drills and drill presses.

5. Identify types of drill press tooling and describe their applications.
  - i. twist drills
  - ii. counterbores
  - iii. countersinks
  - iv. hole saws
  - v. machine taps
  - vi. machine reamers
  - vii. spot facing tools
  - viii. center drills
6. Describe a drill press, its parts and applications.
  - i. base
  - ii. column
  - iii. table
  - iv. drilling head
7. Identify types of drill presses and describe their components and applications.
  - i. sensitive
  - ii. upright
    - parts
    - gear box
    - spindle advance
    - table
    - operating principles
    - capabilities
  - iii. radial arm
    - parts
    - base
    - column
    - radial arm
    - drilling head
    - operating principles
    - capabilities
8. Identify safety precautions when working with a magnetic drilling machine.
9. Define terminology associated with jigs, fixtures and work holding devises.
  - i. vices
    - plain
    - angular/swivel
    - compound
  - ii. parallel clamps
  - iii. c-clamps

10. Identify jigs, fixtures and work holding devices and describe their applications and procedures for use.
  - i. jigs and fixtures
  - ii. work holding devices
    - jacks
    - spacer blocks
    - parallels
  - iii. tool holding devices
    - drill chucks (tapered and threaded)
    - key type
    - keyless
    - drill sleeves
    - drill socket
    - quick change
    - drifts
11. Identify types of machine reamers and describe their use.
  - i. rose
  - ii. fluted
  - iii. carbide tipped
  - iv. shell
12. Describe the procedures used to set up and perform drill press operations.
  - i. drilling
  - ii. counterboring
  - iii. countersinking
  - iv. tapping
  - v. reaming
  - vi. spot facing
  - vii. center drilling
13. Describe the procedures used for drilling and reaming work.
14. Identify materials used to manufacture drills and their application.
  - i. high speed steel
  - ii. cobalt
  - iii. carbide
  - iv. coated
15. Describe the methods of drill sizing.
  - i. fractional size
  - ii. number size
  - iii. letter size
  - iv. metric drills
  - v. use of a drill gauge

- vi. measurement
- 16. Describe the procedures used to inspect and maintain drill press equipment, tooling, accessories and drill presses.
- 17. Describe the procedures used to install tool in spindle.
- 18. Describe the procedures used to sharpen drill bits.
- 19. Identify calculations to verify depth, sizing and positions.
- 20. Identify calculations required to verify sizing and positions of countersinks, counterbores, chamfers and spot faces.
- 21. Define terminology associated with hole finishing tooling.
  - i. reamers
- 22. Identify types of hole finishing tooling and describe their applications.

### Twist Drills

- 23. Identify twist drills and describe their characteristics and applications.
  - i. components
    - shank (tapered and straight)
    - body (flutes, margin, body clearance, web)
    - point (chisel edge, lips, lip clearance, heel, angles, variation, clearances)
- 24. Describe types of drills and their applications.
  - i. high helix
  - ii. core drills
  - iii. oil hole drills
  - iv. straight-fluted drills
  - v. deep hole
  - vi. spade drills
  - vii. hole-saws
  - viii. centre drills
  - ix. jobber drills

25. Describe potential problems during drilling operations, their causes, prevention and remedies.
  - i. discolouration
  - ii. broken or split drill
  - iii. poor tool life
  - iv. holes out of round
  - v. drilling pressures
  - vi. poor hole finish
  - vii. chatter
  - viii. squeaking and jamming
26. Describe the procedures used to sharpen a twist drill.
  - i. using drill sharpening machine
  - ii. using a bench grinder
  - iii. point angle measurement
  - iv. web thinning

### Speeds and Feeds

27. Describe the considerations to determine speed, feed and depth of cut for drill press operations.
  - i. workpiece material
  - ii. cutting tool material
  - iii. manufacturers' specifications
  - iv. formulas
28. Describe the procedure to perform calculations for speed, feed and depth of cut in metric and imperial units.
  - i. materials
  - ii. tool geometry
  - iii. tool material
  - iv. machine setup/rigidity
29. Interpret drill charts and tables.
30. Describe the procedures used for reaming holes.
31. Describe the sequence for drilling operations.

**Practical Requirements:**

1. Sharpen a twist drill with correct clearance angles to suit various materials using freehand method and a drill sharpening machine.
2. Select, install and correctly use drills and accessories.
3. Drill and size holes accurately.
4. Perform spot facing, counterboring and countersinking operations.
5. Ream straight holes.
6. Drill work held in a vise.
7. Tap holes by hand, by drill press and tapping attachment.
8. Use a Magnetic Drill Press in a vertical position.

## MW1861 Introduction to Conventional Lathes

### **Learning Outcomes:**

- Demonstrate knowledge of conventional lathes, their accessories, attachments and applications.
- Demonstrate knowledge of conventional lathe tools and accessories, and their applications.
- Demonstrate knowledge of workpiece set up.
- Demonstrate knowledge of safe work practices and procedures related to sharpening tools.

**Duration:** 45 Hours

**Pre-Requisite(s):** MW1190

### **Objectives and Content:**

1. Define terminology associated with conventional lathes.
2. Describe safety procedures and precautions related to lathe operation.
  - i. safety glasses
  - ii. clothing and jewelry
  - iii. safety guards and lockout controls
  - iv. secure work and tool mounting
  - v. chuck wrench removal
  - vi. use of air hoses
3. Identify types of conventional lathes and describe their operating principles and applications.
  - i. engine
  - ii. turret
  - iii. multispindle
  - i. engine lathe
  - ii. single and multi-spindle automatic lathes
4. Identify the five major components of conventional lathes.
  - i. head stock
  - ii. tail stock
  - iii. bed
  - iv. carriage
  - v. quick change gearbox

5. Identify types of work holding devices and describe their applications.

- i. three-jaw chuck
- ii. four-jaw-chuck
- iii. faceplate
- iv. collect chuck
- v. between centers
- vi. magnetic chuck
- vii. chuck
- viii. lathe centres
  - dead
  - live
  - micro-set
  - adjustable
- ix. chucks
  - three jaw universal
  - four jaw independent
  - spring collett
  - drill chuck
  - magnetic chuck
- x. lathe dogs
  - standard bent-tail
  - straight tail
  - clamp type
- xi. mandrels
  - solid, expansion
  - gang
  - threaded
  - taper shank

6. Identify types of tool holding devices and describe their applications.

- i. toolposts and tool holders
  - left hand offset
  - right hand offset
  - straight turning
  - parting tool
  - threading tool
  - boring bar
- ii. knurling tool
- iii. turret toolpost
- iv. quick change toolpost
- v. face plate

7. Identify types of inspection equipment and describe their use.

- i. dial indicators
- ii. micrometers

8. Describe the procedures used to set up eccentrics on conventional lathes.
9. Describe the procedures used to ensure parts run true.
10. Identify types of conventional lathe tools and describe their characteristics and applications.
  - i. turning
  - ii. boring
  - iii. threading
  - iv. grooving
  - v. facing
  - vi. knurling
  - vii. part off
11. Describe procedures used for preventative maintenance of lathe machines.
  - i. cleaning
  - ii. lubrication
  - iii. adjustments
    - gibs
    - tailstock
    - drive belts
12. Identify types of spindle noses and describe the operating principles.
13. Describe the procedures used to mount and remove chucks.
14. Describe the procedures used to assemble a three-jaw chuck.
15. Describe the factors used to determine speed, feed and depth of cut.
  - i. calculations
  - ii. charts and tables
  - iii. material hardness
  - iv. tool material
  - v. machine condition
  - vi. finish required
  - vii. coolants and cutting fluids

### Cutting Tools

16. Explain tool nomenclature.
  - i. cutting edge
  - ii. face
  - iii. flank nose
  - iv. radius
  - v. point
  - vi. shank
17. Describe the procedures used to sharpen conventional lathe cutting tools.
18. Describe the procedures used to grind cutting tool angles.
19. Describe angles and clearances.
  - i. cutting tools
  - ii. side cutting edge
  - iii. end cutting edge
  - iv. side relief (clearance angle)
  - v. back rake (top)side rake angle point angle
20. Describe the effects of tool characteristics and the importance of tool shape for lathe operations.
  - i. roughing and finishing
  - ii. facing
  - iii. parting and grooving
  - iv. threading tools
  - v. round nose, forming and boring tools
21. Describe the procedures used to install tooling.
22. Describe the procedures used to face internal and external shapes and surfaces.
23. Describe the procedures used to set up and grind a tool bit.

### Carbides

24. Interpret the ANSI and SI systems for the identification of carbide inserts/coatings and tool holders.
25. Describe speeds, feeds and depth of cut of carbide cutting tools.
26. Identify types of carbide tool holding devices and describe their applications.

27. Identify carbide tool failures and describe their causes and remedies.

**Practical Requirements:**

1. Grind a right hand turning and facing tool.
2. Grind a 60 degree threading tool.
3. Grind a parting off or grooving tool.
4. Clean and maintain the parts of a lathe and state their function.
5. Perform adjustments for gib and backlash in the crosslide and compound rest.

## MW1872 Basic Conventional Lathe Operation

### **Learning Outcomes:**

- Demonstrate knowledge of conventional lathes, their maintenance and procedures for use.
- Demonstrate knowledge of cutting tools, their maintenance and procedures for use.
- Demonstrate knowledge of conventional lathe accessories, their maintenance and procedures for use.
- Demonstrate knowledge of machines, troubleshooting and procedures for use.
- Demonstrate knowledge of maintenance and alignment of machines.
- Demonstrate knowledge of workpiece setup.
- Demonstrate knowledge of lathe speeds and feeds.
- Demonstrate knowledge of calculations required to adjust machine control.
- Demonstrate knowledge of work holding devices, their maintenance and procedures for use.
- Demonstrate knowledge of facing, turning, knurling, grooving and parting off operations.

**Duration:** 70 Hours

**Pre- Requisite(s):** MW1190, MW1861

### **Objectives and Content:**

1. Identify hazards and describe safe work practices pertaining to conventional lathes.
2. Describe safety procedures and precautions related to filing and polishing.
3. Describe sequencing of lathe activities.
4. Describe the considerations to determine speed, feed and depth of cut for conventional lathe operations.
5. Identify calculations for speed, feed and depth of cut.
6. Describe the procedures used to set up cutting tools on lathes.
7. Identify conventional lathe accessories and describe their applications.
  - i. taper attachments
  - ii. steady rests
  - iii. follower rests

- iv. centres

8. Identify potential setup problems and describe their causes and solutions.

- i. misalignment
- ii. run-out
- iii. insufficient clearance
- iv. improper adjustments

9. Describe the procedures used to mount and adjust rests.

10. Identify the considerations and requirements for selecting conventional lathe tools and accessories for specific operations.

11. Describe the procedures used to set up work holding devices on lathes.

- i. three-jaw chuck
- ii. four-jaw chuck
- iii. face plate
- iv. collet chuck

12. Identify tools required to set up work holding devices on lathes.

- i. wrenches
- ii. keys
- iii. hook spanners
- iv. chuck wrenches

13. Identify potential work holding devices setup problems and describe their causes and solutions.

14. Describe the procedures used for facing work on a conventional lathe.

15. Identify potential problem when facing surfaces with a conventional lathe and describe their causes and solutions.

- i. chatter
- ii. tool wear
- iii. incorrect tool height setting
- iv. chip management

16. Identify potential problems when turning external surfaces using a conventional lathe and describe their causes and solutions.

- i. chatter
- ii. tool deflection
- iii. taper
- iv. run-out

17. Describe the considerations to determine speed and feed for knurling operations.

18. Identify potential problems when knurling using a conventional lathe and describe their causes and solutions.
19. Identify potential problems when grooving and describe their causes and solutions.
20. Identify potential problems when parting off using a conventional lathe and describe their causes and solutions.
21. Describe the procedures used to perform basic conventional lathe operations.
  - i. grooving
  - ii. facing
  - iii. shoulders
  - iv. parallel turning
  - v. shoulder turning
  - vi. undercutting diameter and shoulders
  - vii. chamfering
  - viii. machining between centres
  - ix. knurling
  - x. parting off
  - xi. grooving

### Machining in a Chuck

22. Describe the procedures used to mount work in a three-jaw chuck.
23. Describe the procedure used to mount work in a four-jaw chuck.
24. Describe the procedures used to set up in a four-jaw chuck using a dial indicator.
25. Describe factors that affect selection of tooling and accessories.
26. Describe the procedures used to cut or part off work in a chuck.
27. Describe the procedures used to set up and operate the lathe.
28. Describe the procedures used to produce rough and finished precision machined work in a chuck.
29. Identify techniques used to troubleshoot conventional lathe operations and describe their associated procedures.
30. Describe the procedures used to inspect and maintain conventional lathes.

**Practical Requirements:**

1. Mount work in a three-jaw chuck.
2. Set up in a four-jaw chuck using a dial indicator.
3. Part off work in a chuck.
4. Perform the procedures for rough and finished turning work in a chuck.
5. Use carbide tooling.
6. Sharpen brazed carbide tooling.
  
7. Set up and operate a lathe.
  - i. machine grooves
  - ii. machine between centres
  - iii. knurl
  - iv. machine diameters to size
  - v. face to length
  - vi. machine to a shoulder
  - vii. parallel turn

## MW1881 Conventional Lathe Drilling, Boring, Reaming, Tapping and Die Threading

### **Learning Outcomes:**

- Demonstrate knowledge of conventional lathe drilling, boring, reaming, tapping and die threading operations.
- Demonstrate knowledge of drilling operations using a conventional lathe.
- Demonstrate knowledge of boring operations.
- Demonstrate knowledge of reaming operations.

**Duration:** 30 Hours

**Pre-Requisite(s):** MW1190, MW1872

### **Objectives and Content:**

1. Identify hazards and describe safe work practices pertaining to conventional lathes.
2. Describe the procedures used for centre drilling and drilling on a conventional lathe.
3. Describe the procedures used for installing drills.
4. Identify potential problems when drilling operations using a conventional lathe and describe their causes and solutions.
  - i. drill wandering
  - ii. oversized holes
  - iii. misalignment of tail stock/turret
  - iv. damage to cutting tool
  - v. chip management
  - vi. incorrect drill geometry
  - vii. insufficient chip and tool clearance
  - viii. chatter
  - ix. tool deflection
  - x. taper
  - xi. run-out
5. Describe the considerations to determine speed, feed and depth of cut for conventional lathe operations.
6. Identify cutting fluids and coolants used during lathe operations.
7. Describe the procedures used to set up speeds and feeds.

8. Identify types of boring tools and describe their applications and procedures for use.
9. Describe the procedures used for boring work on a conventional lathe.
10. Describe the procedures used for counterboring and chamfering work on a conventional lathe.
11. Describe the procedures used for spotting and drilling work on a conventional lathe.
12. Describe the procedures used for reaming work on a conventional lathe.
  - i. reaming allowance
  - ii. speeds
  - iii. feed rates
13. Describe the procedures used for installing reamers.
14. Describe the procedures used for tapping on a conventional lathe.
15. Describe the procedures used for die threading on a conventional lathe.
16. Describe speed, feed and depth of cut for conventional lathe operations.
  - i. reaming
  - ii. drilling
  - iii. tapping
  - iv. die threading
  - v. counterboring
  - vi. countersinking
17. Identify and describe mandrels their applications and procedures for use.
18. Identify hazards and describe safe work practice pertaining to sharpening tools.

**Practical Requirements:**

1. Bore work held in a chuck.
2. Ream work in a lathe.
3. Perform tapping operations on a lathe.
4. Machine outside diameter by holding work on a mandrel.

## MW1900 Taper Turning

### **Learning Outcomes:**

- Demonstrate knowledge of tapers, their attachments and applications.
- Demonstrate knowledge of tapers, their applications and machining operations.
- Demonstrate knowledge of taper turning operations.

**Duration:** 30 Hours

**Pre-Requisite(s):** MW1190, MW1881

### **Objectives and Content:**

1. Define terminology associated with taper turning.
2. Identify hazards and describe safe work practices pertaining to taper turning.
3. Identify types of tapers and describe their applications.
  - i. Morse taper
  - ii. taper pin
  - iii. metric taper
  - iv. pipe thread taper
  - v. milling machine taper
  - vi. self-holding tapers
  - vii. steep tapers
4. Identify types of taper attachments and describe their applications and procedures for use.
  - i. plain
  - ii. telescopic
5. Identify methods used to check tapers and describe their associated procedures.
  - i. plug gauge
  - ii. ring gauge
  - iii. sine bar
  - iv. layout lines
  - v. dial indicator
  - vi. Prussian Blue
  - vii. digital read out

6. Identify methods used to turn tapers and describe their associated procedures.
  - i. taper attachment
  - ii. tailstock offset
  - iii. compound rest
7. Identify potential problems and describe their causes and solutions.
  - i. insufficient chip and tool clearance
  - ii. chatter, tool deflection
  - iii. incorrect taper
  - iv. run out
8. Describe the formula for taper calculations.
  - i. taper per foot
  - ii. taper per inch
  - iii. metric tapers
  - iv. taper advancement
  - v. tail stock offset
9. Describe the procedure to perform angular measurements.
10. Describe the procedures used to fit an external taper.

**Practical Requirements:**

1. Turn tapers (internally and externally).
  - i. compound rest
  - ii. tailstock offset
  - iii. taper attachment
2. Measure taper using available method.
  - i. sinebar
  - ii. three lines
  - iii. chalk or Prussian blue

## MW1912 Basic Threading

### **Learning Outcomes:**

- Demonstrate knowledge of setting up lathes to machine threads.
- Demonstrate knowledge of the procedures used to measure and gauge threads.
- Demonstrate knowledge of cutting internal and external threads according to classification.
- Demonstrate knowledge of basic threads and fits and their applications.
- Demonstrate knowledge of threading operations.
- Demonstrate knowledge of safe work practices and procedures.

**Duration:** 60 Hours

**Pre-Requisite(s):** MW1190, MW1881

### **Objectives and Content:**

#### Thread Characteristics

1. Identify hazards and describe safe work practices pertaining to threading.
2. Describe threads and their applications.
3. Explain thread parts and terminology.
  - i. screw thread
  - ii. internal and external threads
  - iii. major and minor diameter
  - iv. pitch diameter
  - v. number of threads
  - vi. pitch
  - vii. lead
  - viii. root
  - ix. crest
  - x. flank
  - xi. depth of thread
  - xii. angle of thread
  - xiii. helix or lead angle
  - xiv. right and left hand threads

4. Identify thread forms and describe their characteristics and applications.
  - i. ISO metric
  - ii. unified
  - iii. ACME
  - iv. National Pipe thread
  - v. British Standard Whitworth
  - vi. British Standard Fine
  - vii. square and modified square
  - viii. International Metric
  - ix. buttress
5. Explain thread fit terms, classifications and symbols used for imperial and metric threads.
  - i. fit allowance
  - ii. tolerance
  - iii. limits
  - iv. nominal and actual size
  - v. tolerance grades
  - vi. allowance symbols and numbers
6. Describe the importance of thread fit and the use of thread gauges.
7. Identify thread formula that apply to thread forms and parts of a thread.
  - i. 60 degree V thread
  - ii. American National
  - iii. Unified
  - iv. Metric
  - v. minor diameter
  - vi. crest width
  - vii. number thread size
  - viii. tap drill size
  - ix. pitch of the thread
  - x. pitch diameter
  - xi. root width
  - xii. lead
  - xiii. depth
8. Identify types of thread insert failures and describe their causes and solutions.
9. Identify methods used to measure and gauge threads and describe their associated procedures.
10. Calculate and select tap drill sizes in metric and imperial.

Thread Cutting Operations

11. Describe the considerations to determine speed and feed.
12. Identify cutting fluids and coolants used.
13. Describe the procedures used to set speeds and feeds.
14. Identify methods used to cut threads and describe their associated procedures.
15. Describe the procedures used to deburr a workpiece.
16. Identify potential problems and describe their causes and solutions.
  - i. chatter
  - ii. tool deflection
  - iii. taper
  - iv. tool misalignment
17. Describe the procedures used to check and measure threads using inspection equipment.
  - i. thread wires
  - ii. thread micrometers
  - iii. thread gauges
  - iv. nut
  - v. outside micrometers
18. Identify the thread chasing dial and describe its applications and procedures for use.
19. Describe procedures used to reset a threading tool.

**Practical Requirements:**

1. Machine threads.
  - i. unified national course
  - ii. unified national fine
  - iii. right hand external
  - iv. right hand internal
  - v. left hand external
  - vi. left hand internal
2. Machine a metric thread.
3. Perform measurement of threads using the three wire method.
4. Measure thread using alternative methods.

## MW1230 Drawings and Specifications II

### **Learning Outcomes:**

- Demonstrate knowledge of drawings and their applications.
- Demonstrate knowledge of interpreting and extracting information from drawing features.
- Demonstrate knowledge of reference materials and their use.
- Demonstrate knowledge of industry symbols and markings and their applications.
- Demonstrate knowledge of geometric dimensions and tolerances and their applications.

**Duration:** 37 Hours

**Pre-Requisite(s):** MW1772

### **Objectives and Content:**

1. Define terminology associated with drawings.
  - i. engineering
  - ii. isometric
  - iii. orthographic
2. Interpret and extract information from drawing features.
  - i. lay/surface finish systems
  - ii. welding symbols
  - iii. material and processing specifications
  - iv. machining allowances
  - v. standard and geometric dimensioning and tolerancing (GD & T)
3. Identify drawing views and describe their characteristics, purpose and applications.
  - i. sectional
  - ii. auxiliary
4. Identify and interpret industry symbols and markings and describe their applications.
  - i. surface textures
  - ii. violations of true projections
  - iii. auxiliary views
  - iv. positional dimension
  - v. hidden (phantom) lines
  - vi. geometric dimensions and tolerances
  - vii. datums

5. Explain the principles of geometric dimensioning and tolerancing.

**Practical Requirements:**

1. Produce intermediate drawings and transfer information from a workpiece.
2. Determine tolerances and finish symbols.
3. Determine geometric features for a given workpiece.

## MW2082 Mechanical Components

### **Learning Outcomes:**

- Demonstrate knowledge of mechanical components, their applications and procedures for use.
- Demonstrate knowledge of broaches and broaching equipment, their applications, set up and procedures for use.
- Demonstrate knowledge of press equipment, their applications, maintenance and procedures for use.
- Demonstrate knowledge of safe work practices and procedures.

**Duration:** 15 Hours

**Pre-Requisite(s):** MW1190

### **Objectives and Content:**

1. Define terminology associated with mechanical components.
2. Identify hazards and describe safe work practices pertaining to mechanical components.
3. Identify types of fasteners, retainers and locators and describe their characteristics and applications.
  - i. nuts
  - ii. dowel pins
  - iii. washers
  - iv. studs
  - v. snap rings
  - vi. rivets
  - vii. keys
  - viii. splines
  - ix. screws
  - x. lock wires
  - xi. bolts
  - xii. self-locking nuts
4. Identify head styles of threaded fasteners and describe their characteristics and applications.

5. Explain the term “fit” and the types of fits and their applications relating to hubs.
  - i. clearance fits
  - ii. transition fits
  - iii. interference fits
6. Identify techniques used to torque fasteners and describe their associated procedures.
7. Define terminology associated with broaches and broaching equipment.
8. Identify hazards and describe safe work practices pertaining to broaches and broaching machines.
9. Describe the procedures used to set up and operate broaching equipment.
10. Explain the operating principles of broaching equipment.
11. Identify types of broaching equipment and describe their components and applications.
12. Identify types of tooling for broaching equipment and describe their applications.
13. Describe the procedures for cutting keyways.
14. Identify types of keys, keyseats and keyways and describe their characteristics and applications.
  - i. square
  - ii. woodruff
  - iii. flat
  - iv. gib
15. Explain the principles of stepped keys.
16. Describe the procedures used to hand broach keyways.
17. Identify broaches and describe their characteristics and applications.
18. Describe the procedures used to perform hand broaching.
19. Describe the procedures used for safe operation of an arbor press.
20. Describe the procedures used to set up and operate press equipment.
21. Explain the operating principles of press equipment.

22. Identify types of press equipment and describe their components and applications.
23. Identify hazards and describe safe work practices pertaining to the use of press equipment.

**Practical Requirements:**

1. Select the different types of fasteners.
2. Broach a keyway.

## MW2123 Oxy-Fuel Welding and Cutting

### **Learning Outcomes:**

- Demonstrate knowledge of the set up and use oxy fuel welding equipment.
- Demonstrate knowledge of heating processes used in machining operations and their applications.
- Demonstrate knowledge of bending processes used in machining operations and their applications.
- Demonstrate knowledge of safe work practices and procedures.

**Duration:** 30 Hours

**Pre-Requisite(s):** MW1190

### **Objectives and Content:**

1. Describe hazards and safe practices associated with oxy fuel welding equipment.
  - i. welding screens
  - ii. ventilation (local exhausts)
2. Describe the use of PPE associated with arc welding.
  - i. eye and face protection
  - ii. safety goggles
  - iii. welding shields
  - iv. welding jackets
  - v. gloves
  - vi. aprons
  - vii. lens selection
3. Describe safe practices relating to the operation of oxygen and acetylene equipment.
  - i. handling and transporting cylinders
  - ii. storage of cylinders
  - iii. cylinder safety devices
    - bursting discs
    - fusible plugs
    - release valves
  - v. cylinder pressures
  - vi. valve threads
  - vii. contamination of oil and grease
  - viii. flashback arrestor
  - ix. flash back and back fires

4. Describe procedures used to set-up and use welding equipment (OFW).
  - i. safety precautions
  - ii. inspection of work area for possible hazards
  - iii. equipment
  - iv. set up
  - v. adjustment
  - vi. check for leaks
  - vii. light-up procedure
  - viii. flame adjustment
  - ix. shut down procedures
  - x. storage
5. Identify types of tips used in cutting and welding and describe their applications.
  - i. numbering system for tips
  - ii. styles of tips
    - cutting
    - welding
    - heating tips
6. Describe the procedure to perform cutting using oxygen fuel equipment.
7. Define terminology associated with heating processes.
8. Identify heating processes and describe their characteristics and applications.
9. Identify types of heating equipment and describe their applications.
  - i. oxy-fuel torches
10. Describe the procedures used to inspect and store heating equipment.
11. Define terminology associated with bending processes.
12. Identify bending processes and describe their characteristics and applications.
13. Identify types of bending equipment and describe their applications.
  - i. vises
  - ii. hammers
  - iii. presses
14. Identify hazards and describe safe work practices pertaining to heating and bending processes.

**Practical Requirements:**

1. Set up and use oxy-fuel welding equipment.
  - i. cut mild steel freehand

## MW2341 Reconditioning

### **Learning Outcomes:**

- Demonstrate knowledge of the procedures used for reconditioning.
- Demonstrate knowledge of the procedures used for refurbishing components.
- Demonstrate knowledge of the procedures used to analyze components.
- Demonstrate knowledge of calculations required to measure components.
- Demonstrate knowledge of procedures used to prepare documentation.

**Duration:** 15 Hours

**Pre-Requisite(s):** MW1190

### **Objectives and Content:**

1. Identify types of tools used in refurbishing and describe their procedures for use.
  - i. pullers
  - ii. presses
  - iii. portable keyseat cutter
2. Interpret documentation pertaining to refurbishing components.
3. Describe the order of operations used to disassemble components.
4. Describe the instruments used to measure surface roughness.
5. Describe the instruments and procedure used to measure roundness.
6. Describe the instruments used to measure concentricity.
7. Describe the procedures used to clean components.
8. Identify inspection equipment used to inspect components.
  - i. bore gauges
9. Describe the procedure to calculate and measure component features.
10. Describe the procedures used to prepare documentation.
11. Describe the procedures used to inspect components.

**Practical Requirements:**

1. Use portable keyseat cutter to machine a keyseat.

## MW1951 Reciprocating Machines

### **Learning Outcomes:**

- Demonstrate knowledge of slotters and shapers, their applications, set up and procedures for use.

**Duration:** 45 Hours

**Pre-Requisite(s):** MW1190

### **Objectives and Content:**

1. Define terminology associated with reciprocating machines.
2. Identify hazards and describe safe work practices pertaining to reciprocating machines.
3. Identify types of slotters and shapers and describe their components and applications.
4. Calculate speed and feed requirements.

#### Shapers

5. Identify shapers and describe their characteristics and applications.
  - i. parts
  - ii. capacity
6. Describe the procedures used for setting up shapers.
  - i. stroke length
  - ii. stroke positioning
  - iii. work piece alignment
  - iv. ram positioning
7. Describe the procedures used to grind a shaper cutting tool.

#### Slotters

8. Describe the procedures used to set up and operate slotters.
  - i. stroke length
  - ii. stroke angle
  - iii. stroke positioning
  - iv. workpiece alignment

9. Identify slotters and describe their characteristics and applications.
  - i. capacity
  - ii. applications
10. Describe the tool holders and cutters used with slotters.
11. Identify work holding devices used with slotters and describe their characteristics and applications.

**Practical Requirements:**

1. Perform speed, feed and depth calculations.
2. Set stroke length and ram positioning.
  - i. machine a surface using a shaper
  - ii. cut a keyway using a slotter

## MW1921 Introduction to Milling Machines

### **Learning Outcomes:**

- Demonstrate knowledge of milling machines, their accessories, attachments and applications.
- Demonstrate knowledge of milling cutting tools and their applications.
- Demonstrate knowledge of conventional milling machines, their setup and procedure for use.
- Demonstrate knowledge of tool geometry and its use.

**Duration:** 72 Hours

**Pre-Requisite(s):** MW1190

### **Objectives and Content:**

1. Define terminology associated with conventional milling machines.
2. Identify hazards and describe safe work practices pertaining to conventional milling machines.
3. Identify types of conventional milling machines and describe their applications.
  - i. vertical
  - ii. universal/vertical
  - iii. plain horizontal
4. Identify the components and controls of conventional milling machines and describe their purpose and operation.
  - i. base
  - ii. table
  - iii. housing
  - iv. overarm and arbor supports
  - i. knee
  - ii. column
  - iii. saddle
  - iv. speed and feed controls
  - v. hand wheels, cranks and graduated collars
  - vi. coolant system
  - vii. backlash eliminator
  - viii. table swivel block
  - ix. feed trip dogs and limit stops

- x. parts and controls specific to vertical mills
- xi. elevating mechanism
- xii. drive
- xiii. overarm (ram)
- xiv. draw bolts
- xv. digital readout

5. Identify types of milling machine accessories and attachments and describe their applications and maintenance.

- i. fixture
- ii. arbors, collets and adaptor
- iii. vises
- iv. dividing head
- v. backlash eliminator
- vi. clamps
- vii. t-nuts
- viii. slotting attachment
- ix. vertical attachment
- x. edge finder/centre finder
- xi. offset boring head

6. Identify types of tool holding devices and describe their applications.

7. Identify types of work holding devices and describe their applications and maintenance.

8. Identify types of materials used in milling cutter construction and describe their characteristics.

- i. high speed steel
- ii. tungsten carbide
- iii. titanium
- iv. cemented carbides
- v. ceramic

9. Identify types of cutting tools and describe their applications.

- i. plain milling cutters
- ii. standard shank-type helical milling cutters
- iii. side milling cutters
- iv. face milling cutters
- v. angular cutters
- vi. formed cutters
- vii. metal saws
- viii. end mills
- ix. t-slot cutters

- x. dovetail cutter
- xi. woodruff keyseat cutter
- xii. flycutters

10. Identify milling cutter failures and describe their causes and remedies.
11. Describe climb and conventional milling.
12. Describe tool geometry.
  - i. chip breaker
  - ii. primary and secondary clearances

#### Milling Machine Setup

13. Describe the procedures used to install tooling and tool holding devices.
  - i. drill chuck
  - ii. collet chuck
  - iii. end mill holders
  - iv. shell mill holders
  - v. arbors
  - vi. boring heads
14. Identify considerations and requirements used for selecting tooling and tool holding devices for milling operations.
15. Describe the factors that determine milling feed, speed and depth of cut calculations and their importance.
16. Describe the procedures used to perform calculations for milling feed and depth of cut for metric and imperial milling operations.
17. Describe the procedures used to align a vise on a milling machine.
18. Describe procedures used to align vertical milling machine head.
19. Describe procedures used to locate an edge.
20. Describe the procedures used to clean and lubricate milling machines.
21. Describe potential set-up problems, their causes and remedies.
22. Describe the procedures used to set up and cut opposing keyways in a shaft.
23. Describe the rectangular coordinates system.

24. Describe procedures to perform basic indexing.

**Practical Requirements:**

1. Align a vise on a milling machine set up and remove attachments.
2. Set up indexing head and foot stock.
3. Machine keyseats.
  - i. woodruff
  - ii. square
4. Drill bolt circle using digital readout.
5. Use an offset boring head and mill slots.

## MW2061 Computer Numerical Control (CNC) Machine Tools

### **Learning Outcomes:**

- Demonstrate a basic knowledge of CNC machine and tools, their accessories, attachments and applications.

**Duration:** 15 Hours

**Pre-Requisite(s):** MW1190

### **Objectives and Content:**

1. Define terminology associated with CNC machines and tools.
2. Identify the hazards and describe safe work practices pertaining to CNC machines and tools.
3. Describe the advantages of using CNC machine and tools.
  - i. machine tool movement
  - ii. accuracy
  - iii. reliability
  - iv. repeatability
  - v. productivity
4. Identify CNC axes and describe the relationship between them.
5. Identify types of CNC machines and tools and describe their characteristics and applications.
  - i. type
  - ii. size
  - iii. turning centre
  - iv. combination
  - v. vertical
  - vi. horizontal

6. Identify types of accessories and tool changers used with CNC machines and tools and describe their applications.
  - i. tool changers
  - ii. accessories
  - iii. tool holders
  - iv. work holding devices
7. Identify types of tool holders and work holding devices used with CNC machines and tools and describe their applications.

**Practical Requirements:**

None.

## MW2071 Computer Numerical Control (CNC) Operation 1

### **Learning Outcomes:**

- Demonstrate knowledge of basic CNC programming.
- Demonstrate knowledge of CNC machines and tools, their set up, maintenance and procedures for use.

**Duration:** 45 Hours

**Pre-Requisite(s):** MW2061, MW1921, MW1912

### **Objectives and Content:**

1. Identify CNC control units and describe their purpose.
2. Identify types of basic programming codes and languages and describe their applications.
  - i. G-codes
  - ii. M-codes
3. Identify CNC related reference points and their location.
4. Describe the procedures used to perform basic CNC programming.
  - i. review process documentation
  - ii. calculate coordinates for tool path
  - iii. create basic program
  - iv. input program data into control memory
  - v. optimize program
5. Describe the procedures used to set up CNC machines.
  - i. send/receive program
  - ii. select and set up tooling and tool holder
  - iii. tool offsets
  - iv. set up workpiece
  - v. establish work datum
  - vi. verify program

6. Describe the procedures used to operate CNC machines.
  - i. adjust offsets
  - ii. load/unload workpiece
  - iii. monitor process
  - iv. interrupt program cycle
  - v. restart program cycle
7. Describe the procedures used to perform basic preventative maintenance.

**Practical Requirements:**

1. Write a program to produce a simple part on the CNC mill and lathe.
2. Operate the CNC mill and lathe to produce the part.

## MW1942 Job Planning

### **Learning Outcomes:**

- Demonstrate knowledge of the procedures used to plan and organize jobs.

**Duration:** 25 Hours

**Pre-Requisite(s):** MW1190

### **Objectives and Content:**

1. Identify sources of information relevant to job planning.
  - i. work orders/shop orders
  - ii. technical data
  - iii. reference materials
  - iv. drawings
  - v. related professionals
  - vi. clients
  - vii. quality standards (International Standards Organization)
2. Identify the considerations and requirements for selecting equipment and tooling to complete specified jobs.
3. Determine amount of materials required to complete specified jobs.
4. Interpret and complete relevant trade documentation.
5. Interpret advanced drawing specifications.
  - i. tolerance
  - ii. finish requirements
  - iii. geometric dimensioning and tolerancing
6. Identify operations to be performed in priority sequence.
7. Calculate cutting time requirements.
8. Identify and explain fixed and variable costs.

**Practical Requirements:**

1. Perform cutting time calculations.
2. Perform a cost estimate for a given job.
3. Make a simple part and monitor machining time.

**MW1945 Mentoring**

**Learning Outcomes:**

- Demonstrate knowledge of strategies for learning skills in the workplace.
- Demonstrate knowledge of strategies for teaching workplace skills.

**Duration:** 6 Hours

**Pre-Requisite(s):** None

**Objectives and Content:**

1. Describe the importance of individual experience.
2. Describe the shared responsibilities for workplace learning.
3. Determine one's own learning preferences and explain how these relate to learning new skills.
4. Recognize and describe the importance of different types of skills in the workplace.
5. Describe the importance of essential skills in the workplace.
  - i. reading
  - ii. writing
  - iii. document use
  - iv. oral communication
  - v. numeracy
  - vi. thinking skills
  - vii. working with others
  - viii. digital technology
  - ix. continuous learning
6. Identify and utilize different learning styles.
  - i. seeing it
  - ii. hearing it
  - iii. trying it
  - iv. applying it
7. Identify different learning needs and describe the strategies to meet these needs.
  - i. learning disabilities
  - ii. learning preferences
  - iii. language proficiency

8. Identify strategies to assist in learning a skill.
  - i. understanding basic principles of instruction
  - ii. developing coaching skills
  - iii. being mature and patient
  - iv. providing feedback
9. Identify different roles played by a workplace mentor.
10. Describe teaching skills.
  - i. identifying the point of the lesson
  - ii. linking the lesson
  - iii. demonstrating the skill
  - iv. providing practice
  - v. giving feedback
  - vi. assessing skills and progress
11. Explain the importance of identifying the point of a lesson.
12. Identify how to choose a good time to present a lesson.
13. Explain the importance of linking the lesson.
14. Identify the components of the skill (the context).
15. Describe considerations in setting up opportunities for skill practice.
16. Explain the importance of providing feedback.
17. Identify techniques for giving effective feedback.
18. Describe a skills assessment.
19. Identify methods of assessing progress.
20. Explain how to adjust a lesson to different situations.

**Practical Requirements:**

None.

## AM1000 Introduction to Essential Skills

### **Learning Outcomes:**

- Demonstrate knowledge of the nine nationally recognized essential skills.
- Demonstrate knowledge of the essential skills levels of complexity.
- Demonstrate knowledge of the essential skills required for the learners chosen trade.
- Demonstrate an awareness of essential skills assessments.

**Duration:** 9 Hours

**Pre-Requisite(s):** None

### **Objectives and Content:**

1. Identify and describe the essential skills recognized by the Government of Canada through the Office of Literacy and Essential Skills (OLES).
  - i. reading
  - ii. document use
  - iii. numeracy
  - iv. writing
  - v. oral communication
  - vi. working with others
  - vii. thinking
  - viii. computer use
  - ix. continuous learning
2. Describe the Levels of Complexity measurement assigned to essential skills.
3. Identify the essential skills, along with their complexity level, identified as necessary for the learner's trade.
  - i. RSOS / NOA content<sup>1</sup>
  - ii. OLES Essential Skills Profiles<sup>2</sup>
  - iii. OLES tools and support for apprentices and tradespersons<sup>3</sup>
4. Describe the nature and purpose of essential skills assessment.
  - i. self-assessment & formal assessment tools
  - ii. indicators of deficiencies
  - iii. suggestions for improvement

5. Describe the benefits of essential skills improvement.
  - i. confidence at work
  - ii. employability
  - iii. success in apprenticeship
  - iv. wage & job advancement

**Practical Requirements:**

1. Complete an essential skills self-assessment addressing numeracy, document use and reading. The online **Government of Canada Essential Skills Indicator**<sup>4</sup> and **Essential Skills self-assessment for the trades**<sup>5</sup> are to be used unless the instructor provides a similar assessment tool or tools.
2. Participate in a group discussion about the impact of gaps in essential skills that may be revealed by the self-assessments completed, and the value of improving essential skills.

Students are graded complete or incomplete on this practical work, no grade is permitted for self-assessment performance. However, completion of the practical requirements is mandatory for completion of this unit.

**Resources:**

All footnotes are in the companion document “Resources for Introduction to Essential Skills” which is available online from Apprenticeship and Trade Certification.

## AM1101 Math Essentials

**Note:** It is recommended that AM1101 be delivered in the first semester of the Pre-Employment program.

### **Learning Outcomes:**

- Demonstrate knowledge of essential numeracy skills.
- Demonstrate knowledge of mathematics as a critical element of the trade environment.
- Demonstrate knowledge of mathematical principles in trade problem solving situations.
- Demonstrate the ability to solve simple mathematical word problems.

**Duration:** 42 Hours

**Pre-Requisite(s):** None

### **Objectives and Content:**

Wherever possible, the instructor is expected to use trade specific examples to reinforce the course objectives.

1. Describe whole number operations.
  - i. read, write, count, round off, add, subtract, multiply and divide whole numbers.
2. Describe the application of the order of operations in math problems.
3. Describe fraction and mixed number operations.
  - i. read, write, add, subtract, multiply and divide fractions.
4. Describe decimal operations.
  - i. read, write, round off, add, subtract, multiply and divide decimals.
5. Describe percent/decimal/fraction conversion and comparison.
  - i. convert between fractions, decimals and percents.
6. Identify percentage operations.
  - i. read and write percentages
  - ii. calculate base, rates and percentages
7. Identify ratio and proportion operations.
  - i. use a ratio comparing two quantities with the same units
  - ii. use a proportion comparing two ratios

8. Describe the use of the imperial measurement system in math problems.
  - i. identify units of measurement
    - length
    - mass
    - area
    - volume
    - capacity
9. Describe the use of the metric measurement system in math problems.
  - i. identify units of measurement
    - length
    - mass
    - area
    - volume
    - capacity
10. Identify angles, lines and geometric shapes.
  - i. use a protractor to measure angles
  - ii. determine whether an angle is right, acute or obtuse
  - iii. identify parallel, perpendicular, horizontal and vertical lines
  - iv. identify types of triangles, quadrilaterals, and 3-dimensional shapes
11. Describe estimation strategies.
  - i. estimate a linear measure using a referent
  - ii. estimate length, area and volume of objects in metric and imperial systems
12. Describe problem solving that involves linear measurement using instruments such as rulers or tape measures, in the metric and imperial systems.

**Practical Requirements:**

To emphasize or further develop specific knowledge objectives, students will be required to complete practical demonstrations which confirm proper application of mathematical theory to job skills.

## AM1180 Industrial Math Fundamentals

### **Learning Outcomes:**

- Demonstrate knowledge of mathematical concepts in the performance of trade practices.
- Demonstrate knowledge of mathematics as a critical element of the trade environment.
- Solve mathematical word problems.
- Demonstrate knowledge of mathematical principles for the purposes of problem solving, job and materials estimation, measurement, calculation, system conversion, diagram interpretation and scale conversions, formulae calculations, and geometric applications.

**Duration:** 42 Hours

**Pre-Requisite(s):** AM1101

### **Objectives and Content:**

The instructor is required to use trade specific examples to reinforce the course objectives.

1. Describe percent/decimal/fraction conversions and comparisons in trade specific situations.
2. Describe ratios and proportions as they relate to trade specific problems.
3. Describe the use of the Imperial and Metric measurement systems in trade specific applications.
4. Describe Imperial and Metric conversions in trade specific situations.
  - i. convert between imperial and metric measurements
  - ii. convert to another unit within the same measurement system
5. Describe how to manipulate formulas using cross multiplication, dividing throughout, elimination, and substitution to solve trade specific problems.
  - i. right angle triangles
  - ii. area
  - iii. volume
  - iv. perimeter
  - v. density

6. Identify calculations involving geometry that are relevant to the trade.
  - i. angle calculations
  - ii. circle calculations
7. Identify math processes used to complete administrative trade tasks.
  - i. material estimation
  - ii. material costing
  - iii. time & labour estimates
  - iv. taxes & surcharges
  - v. markup & projecting revenue

**Practical Requirements:**

1. To emphasize or further develop specific knowledge objectives, students will be asked to complete practical demonstrations which confirm proper application of mathematical theory to job skills.
2. This course is **non-transferable** to other trades programs, and **not eligible for prior learning assessment**. Students completing training in this trade program are required to complete this math course. Apprentice transfers under Provincial / Territorial Mobility agreements may be exempt from this requirement.

## CM2161 Communication Essentials

### **Learning Outcomes:**

- Demonstrate knowledge of the importance of well-developed writing and oral communication skills in the workplace.
- Demonstrate knowledge of the principles of effective workplace writing.
- Demonstrate knowledge of the purpose of various types of workplace documentation and workplace meetings.
- Demonstrate knowledge of the importance of effective interpersonal skills in the workplace.
- Demonstrate knowledge of effective job search techniques.

**Duration:** 36 Hours

**Pre-Requisite(s):** None

### **Objectives and Content:**

Wherever possible, the instructor is expected to use trade specific examples to reinforce the course objectives.

1. Define communications terminology used in the trade.
2. Identify the principles of effective workplace writing.
  - i. grammar, punctuation, mechanics
  - ii. sentence and paragraph construction
  - iii. tone, language, and word choice
  - iv. the writing process
    - planning
    - writing
    - editing/revising
3. Identify sources of information used to communicate in the workplace.
  - i. regulations
  - ii. codes
  - iii. OH&S requirements
  - iv. prints, drawings and specifications
  - v. company and client documentation

4. Identify types and purposes of informal workplace documents.
  - i. reports
    - incident
    - process
    - progress
  - ii. common trade specific forms
  - iii. primary and secondary methods of information gathering
  - iv. accuracy and completeness in reports and forms
5. Demonstrate an understanding of interpersonal communications in the workplace.
  - i. recognize group dynamics
  - ii. contribute information and expertise
  - iii. individual learning styles
    - Audible
    - Visual
    - Experiential
    - Theoretical
  - iv. recognize respectful and open communication
  - v. accept and provide feedback
  - vi. interpret non-verbal communication cues
    - body language
    - signals
6. Demonstrate an understanding of effective oral communication skills.
  - i. listening
    - receiving, understanding, remembering, reflecting, evaluating, paraphrasing, and responding
  - ii. speaking
    - using clear and proper words
    - tone, style, and vocabulary
    - brevity
  - iii. common workplace oral communication situations
    - introducing self and others
    - telephone conversations
    - tool box/safety talks
    - face-to-face conversations
    - communicating with co-workers, supervisors, clients, and other trades people

7. Identify common practices related to workplace meetings.
  - i. meeting formats
  - ii. meeting preparation
  - iii. agendas and minutes
  - iv. roles, responsibilities, and etiquette of meeting participants
8. Identify acceptable workplace use of communication technologies.
  - i. cell / smart phone etiquette
  - ii. voice mail
  - iii. e-mail
  - iv. texting / messaging through social media
  - v. teleconferencing / videoconferencing for meetings and interviews
  - vi. social networking
  - vii. other emerging technologies
9. Demonstrate an understanding of effective job search techniques.
  - i. employment trends, opportunities, and sources of employment
  - ii. job ads and the importance of fitting qualifications to job requirements
  - iii. resumes
    - characteristics of effective resumes
    - types of resumes
    - principles of resume formatting
  - iv. effective cover letters
  - v. job interview process
    - pre-interview preparation
    - interview conduct
    - post-interview follow up

**Practical Requirements:**

1. Write a well-developed, coherent, unified paragraph.
2. Complete a trade-related form.
3. Prepare an agenda for a toolbox safety talk.
4. Participate in a simulated oral workplace communication situation.
5. Prepare a resume.

## SD1761 Workplace Essentials

**Note:** It is recommended that SD1761 be delivered in the second half of Pre-Employment training.

### **Learning Outcomes:**

- Demonstrate a knowledge of workplace requirements in the areas of personal responsibility, unions, workers compensation, workers' rights, and human rights.
- Demonstrate a knowledge of quality customer service.

**Duration:** 24 Hours

**Pre-Requisite(s):** None

### **Objectives and Content:**

Wherever possible, the instructor is expected to use trade specific examples to reinforce the course objectives.

1. Identify personal responsibilities and attitudes that contribute to on-the-job success.
  - i. asking questions
  - ii. working safely
  - iii. accepting constructive feedback
  - iv. time management & punctuality
  - v. respect for authority
  - vi. stewardship of materials, tools and properties
2. Define unions and identify their role in the workplace.
  - i. purpose of unions
  - ii. common union structure
  - iii. unions in this trade
3. Demonstrate an understanding of the Worker's Compensation process.
  - i. aims, objectives, and benefits of the Workplace Health, Safety and Compensation Commission
  - ii. role of the workers advisor
  - iii. internal review process

4. Demonstrate an understanding of worker's rights.
  - i. labour standards
  - ii. regulations, including:
    - hours of work & overtime
    - termination of employment
    - minimum wages & allowable deductions
    - statutory holidays, vacation time, and vacation pay
5. Demonstrate an understanding of human rights issues.
  - i. awareness of the Human Rights Code and the role of the Human Rights Commission
  - ii. categories of discrimination and strategies for prevention
    - direct
    - systemic
    - adverse effect
  - iii. types of discrimination
    - race
    - ethnic origin
    - colour
    - religion
    - age
    - gender identify
    - sexual orientation
    - marital status
    - family status
    - disability
    - criminal conviction that has been pardoned
  - iv. conduct that constitutes harassment and discrimination
    - objectionable conduct
    - comments or displays made either on a one-time or continuous basis that demeans, belittles, or causes personal humiliation or embarrassment to the recipient
  - v. the value of diversity in the workplace
    - culture
    - gender identify
    - sexual orientation

6. Demonstrate an understanding of quality customer service.
  - i. importance of quality service
  - ii. barriers to quality service
    - physical and physiological
    - cultural
    - technological
  - iii. customer needs & common methods for meeting them
  - iv. characteristics & importance of a positive attitude
  - v. interactions with challenging customers
  - vi. addressing complaints and resolve conflict

**Practical Requirements:**

None.

## MC1062 Computer Essentials

### **Learning Outcomes:**

- Demonstrate knowledge of desktop/laptop and mobile computers and their operation.
- Demonstrate knowledge of word processing and spreadsheet software, internet browsers and their applications.
- Demonstrate knowledge of e-mail applications and procedures.
- Demonstrate an awareness of security issues related to computers.
- Demonstrate an awareness of online learning using computers.

**Duration:** 15 Hours

**Pre-Requisite(s):** None

### **Objectives and Content:**

When possible, the instructor is expected to use trade specific examples to reinforce the course objectives.

1. Identify computer types used in the workplace, and the characteristics of each.
  - i. desktop/laptop computers
  - ii. tablets
  - iii. smartphones
2. Identify common desktop and mobile operating systems.
  - i. Windows
  - ii. Mac OS
  - iii. iOS
  - iv. Android
3. Describe the use of Windows operating system software.
  - i. start and end a program
  - ii. use the help function
  - iii. use the find function
  - iv. maximize and minimize a window
  - v. open and scroll through multiple windows
  - vi. use the task bar
  - vii. adjust desktop settings such as screen savers, screen resolution, and backgrounds
  - viii. shut down a computer

4. Identify the skills necessary to perform file management commands.
  - i. create folders
  - ii. copy files and folders
  - iii. move files and folders
  - iv. rename files and folders
  - v. delete files and folders
5. Describe the use of word processing software to create documents.
  - i. enter & edit text
  - ii. indent and tab text
  - iii. change text attributes
    - bold
    - underline
    - font
  - iv. change layout format
    - margins
    - alignment
    - line spacing
  - v. spell check and proofread
  - vi. save, close & reopen a document
  - vii. print document
6. Describe the use of spreadsheet software to create documents.
  - i. enter data in cells
  - ii. format data in cells
  - iii. create formulas to add, subtract, multiply and divide
  - iv. save, close & reopen a spreadsheet
  - v. print spreadsheet
7. Describe the use of the internet in the workplace.
  - i. web browsers
  - ii. search engines
  - iii. security issues
  - iv. personal responsibility for internet use at work

8. Describe the role of e-mail.
  - i. e-mail etiquette
    - grammar and punctuation
    - privacy issues when sharing and forwarding e-mail
    - work appropriate content
    - awareness of employer policies
  - ii. managing e-mail
    - using folders
    - deleting, forwarding, replying
  - iii. adding attachments to e-mail
  - iv. view e-mail attachments
  - v. printing e-mail
9. Describe computer use for online learning.
  - i. online training
  - ii. level exams
  - iii. study guides
  - iv. practice exams

**Practical Requirements:**

1. Create, save and print a document using word processing software.
2. Create, save and print a document using spreadsheet software.
3. Send and receive an e-mail with an attachment.

## AP1102 Introduction to Apprenticeship

### **Learning Outcomes:**

- Demonstrate knowledge of how to become a registered apprentice.
- Demonstrate knowledge of the steps to complete an apprenticeship program.
- Demonstrate knowledge of various stakeholders in the apprenticeship process.
- Demonstrate knowledge of the Red Seal Program.

**Duration:** 12 Hours

**Pre-Requisite(s):** None

### **Objectives and Content:**

1. Define terminology associated with apprenticeship.
  - i. apprentice
  - ii. registered apprentice
  - iii. trade qualifier
  - iv. journeyperson
  - v. certified journeyperson
  - vi. Certificate of Apprenticeship
  - vii. Certificate of Qualification
  - viii. dual certification
  - ix. compulsory trades
2. Explain the roles and responsibilities of those involved in the apprenticeship system in Newfoundland and Labrador.
  - i. registered apprentice
  - ii. training institution
  - iii. employer
  - iv. journeyperson
  - v. mentor
  - vi. Department of Jobs, Immigration and Growth
    - Industrial Training section
    - Standards and Curriculum section
  - vii. Provincial Trade Advisory Committees (PTAC)
  - viii. Provincial Apprenticeship and Certification Board (PACB)

3. Describe the training components of an apprenticeship.
  - i. in-school
    - Pre-Employment / Level 1
    - advanced levels
  - ii. workplace experience
4. Explain the steps in the registered apprenticeship process.
  - i. meet entrance requirements
    - education
    - employment
    - Recognition of Prior Learning (RPL) - if applicable
  - ii. complete the registration process
    - application
    - required documents
  - iii. complete the Memorandum of Understanding (MOU)
    - contract responsibilities
    - probation period
    - cancellation
  - iv. maintain Record of Occupational Progress (Logbook)
    - sign off skills
    - record hours
    - update Apprenticeship Program Officer (APO) on progress
  - v. class calls
    - hour requirements
    - EI eligibility
    - training schedule
  - vi. level examinations - if applicable
  - vii. progression schedule
    - apprenticeship level
    - wage rates
  - viii. certification examinations
    - Provincial
    - Red Seal
      - written
      - practical - if applicable
  - ix. certification
    - Certificate of Apprenticeship
    - Certificate of Qualification
    - Provincial journeyperson - Blue Seal
    - Interprovincial journeyperson - Red Seal endorsement (RSE)
5. Identify the Conditions Governing Apprenticeship.

6. Discuss cancellation of apprenticeship.
  - i. failure to notify of address change
  - ii. extended periods of unemployment
  - iii. lack of contact with an APO for an extended period
  - iv. failure to respond to class calls
  - v. declining of multiple class calls
7. Explain the Red Seal program.
  - i. designated Red Seal trades
  - ii. the Red Seal Occupational Standard (RSOS)
  - iii. relationship of RSOS to Red Seal examination
  - iv. national qualification recognition and mobility
8. Identify the current financial incentives available to apprentices.
  - i. Federal
  - ii. Provincial
9. Explain the Provincial / Territorial Apprentice Mobility Guidelines.
  - i. temporary mobility
  - ii. permanent mobility
10. Describe Atlantic and National Harmonization initiatives.

### **Practical Requirements:**

1. Use the Provincial Apprenticeship and Trades Certification website at [www.gov.nl.ca/atcd](http://www.gov.nl.ca/atcd)
  - i. locate, download, and complete the Application for Apprenticeship and Memorandum of Understanding (MOU)
  - ii. locate the address of the Industrial Training office closest to this campus
  - iii. locate the training schedule and identify the start date of the next class call for this trade
  - iv. locate and review the learning resources applicable to this trade
    - Study Guide
    - Exam Preparation Guide
    - Plan of Training
2. Use the Plan of Training applicable to this trade.
  - i. locate the hours for the trade
    - total in-school
    - total required for certification
  - ii. locate the number of levels
  - iii. locate the courses in each level
  - iv. locate the hours required for progression to a Level II apprentice and the wage percentage of that level

## C. Conditions Governing Apprenticeship Training

### 1.0 General

The following general conditions apply to all apprenticeship training programs approved by the Provincial Apprenticeship and Certification Board (PACB) in accordance with the **Apprenticeship and Certification Act (1999)**. If an occupation requires additional conditions, these will be noted in the specific Plan of Training for the occupation. In no case should there be a conflict between these conditions and the additional requirements specified in a certain Plan of Training. All references to Memorandum of Understanding will also apply to Letter of Understanding (LOU) agreements.

### 2.0 Entrance Requirements

#### 2.1 Entry into the occupation as an apprentice requires:

Indenturing into the occupation by an employer who agrees to provide the appropriate training and work experiences as outlined in the Plan of Training.

#### 2.2 Notwithstanding the above, each candidate must have successfully completed a high school program or equivalent, and in addition may be required to have completed certain academic subjects as specified in a particular Plan of Training. Mature students, at the discretion of the Director of Apprenticeship and Trades Certification, may be registered. A mature student is defined as one who has reached the age of 19 and who can demonstrate the ability and the interest to complete the requirements for certification.

#### 2.3 At the discretion of the Director of Apprenticeship and Trades Certification, credit toward the apprenticeship program may be awarded to an apprentice for previous work experience and/or training as validated through prior learning assessment.

#### 2.4 An Application for Apprenticeship form must be duly completed along with a Memorandum of Understanding as applicable to be indentured into an Apprenticeship. The Memorandum of Understanding must contain signatures of an authorized employer representative, the apprentice and an official representing the Provincial Apprenticeship and Certification Board to be valid.

#### 2.5 A new Memorandum of Understanding must be completed for each change in an employer during the apprenticeship term.

### **3.0 Probationary Period**

The probationary period for each Memorandum of Understanding will be six months or 900 employment credit hours. Within that period the memorandum may be terminated by either party upon giving the other party and the PACB one week notice in writing.

### **4.0 Termination of a Memorandum of Understanding**

After the probationary period referred to in Section 3.0, the Memorandum of Understanding may be terminated by the PACB by mutual consent of the parties involved, or cancelled by the PACB for proper and sufficient cause in the opinion of the PACB, such as that stated in Section 14.

## 5.0 Apprenticeship Progression Schedule, Wage Rates and Advanced Training Criteria

### Progression Schedule

| Machinist 7200 Hours  |           |   |                             |
|---|-----------|---|-----------------------------|
| Apprenticeship Level and Wages  |           |   |                             |
| Level   | Wage Rate | Requirements for Progression to Next Level  | Next Level                  |
| 1 <sup>st</sup>   | 60%       | <ul style="list-style-type: none"> <li>▪ Completion of Pre-Employment training</li> <li>▪ Registration as an apprentice</li> <li>▪ Pass Level 1 exam*</li> <li>▪ Minimum 1800 hours of combined relevant work experience and training</li> </ul>  | 2 <sup>nd</sup> Year        |
| 2 <sup>nd</sup>   | 70%       | <ul style="list-style-type: none"> <li>▪ Completion of Level 2 training</li> <li>▪ Pass Level 2 exam*</li> <li>▪ Minimum 3600 hours of combined relevant work experience and training</li> </ul>  | 3 <sup>rd</sup> Year        |
| 3 <sup>rd</sup>   | 80%       | <ul style="list-style-type: none"> <li>▪ Completion of Level 3 training</li> <li>▪ Pass Level 3 exam*</li> <li>▪ Minimum 5400 hours of combined relevant work experience and training</li> </ul>  | 4 <sup>th</sup> Year        |
| 4 <sup>th</sup>   | 90%       | <ul style="list-style-type: none"> <li>▪ Completion of Level 4 training</li> <li>▪ Pass Level 4 exam*</li> <li>▪ Minimum 7200 hours of combined relevant work experience and training</li> <li>▪ Sign-off of all workplace skills in apprentice logbook</li> <li>▪ Pass certification exam</li> </ul> | Journeyperson Certification |
| <p><b>Wage Rates</b></p> <ul style="list-style-type: none"> <li>▪ Rates are percentages of the prevailing journeyperson's wage rate in the place of employment of the apprentice.</li> <li>▪ Rates must not be less than the wage rate established by the Labour Standards Act (1990), as now in force or as hereafter amended, or by other order, as amended from time to time replacing the first mentioned order.</li> <li>▪ Rates must not be less than the wage rate established by any collective agreement which may be in force at the apprentice's workplace.</li> <li>▪ Employers are free to pay wage rates above the minimums specified.</li> </ul> <p><b>Level Exams*</b></p> <ul style="list-style-type: none"> <li>▪ This program may <b>not</b> currently contain Level Exams, in which case this requirement will be waived until such time as Level Exams are available.</li> </ul> |           |   |                             |

| Machinist - 7200 Hours  |  |                                      |
|---|--|--------------------------------------|
| Class Calls (After Apprenticeship Registration)   |  |                                      |
| Call Level  | Requirements for Class Call  | Hours Awarded for In-School Training |
| Direct Entry<br>Level 1   | <ul style="list-style-type: none"> <li>▪ Minimum of 1800 hours of relevant work experience</li> <li>▪ Prior Learning Assessment (PLA) at designated college (if applicable)</li> </ul> | 480                                  |
| Level 2   | <ul style="list-style-type: none"> <li>▪ Minimum of 3000 hours of relevant work experience and training</li> </ul>   | 300                                  |
| Level 3   | <ul style="list-style-type: none"> <li>▪ Minimum of 5000 hours of relevant work experience and training</li> </ul>   | 240                                  |
| Level 4   | <ul style="list-style-type: none"> <li>▪ Minimum of 7000 hours of relevant work experience and training</li> </ul>   | 240                                  |
| Class Calls at Minimum Hours:   |  |                                      |
| <ul style="list-style-type: none"> <li>▪ Class calls may not always occur at the minimum hours indicated. Some variation is permitted to allow for the availability of training resources and apprentices.</li> </ul> |  |                                      |

## 6.0 Tools

Apprentices shall be required to obtain their own hand tools applicable for the designated occupation of registration or tools as specified by the PACB.

## 7.0 Periodic Examinations and Evaluation

- 7.1 Every apprentice shall submit to such occupational tests and examinations as the PACB shall direct. If after such occupational tests and examinations the apprentice is found to be making unsatisfactory progress, his/her apprenticeship level and rate of wage shall not be advanced as provided in Section 5 until his/her progress is satisfactory to the Director of Apprenticeship and Trades Certification and his/her date of completion shall be deferred accordingly. Persistent failure to pass required tests shall be a cause for revocation of his/her Memorandum of Understanding.
- 7.2 Upon receipt of reports of accelerated progress of the apprentice, the PACB may shorten the term of apprenticeship and advance the date of completion accordingly.
- 7.3 For each and every course, a formal assessment is required for which 70% is the pass mark. A mark of 70% must be attained in both the theory examination and the practical project assignment, where applicable as documented on an official transcript.

7.4 Course credits may be granted through the use of a PACB approved matrix which identifies course equivalencies between designated trades and between current and historical Plans of Training for the same trade.

## **8.0 Granting of Certificates of Apprenticeship**

Upon the successful completion of apprenticeship, the PACB shall issue a Certificate of Apprenticeship.

## **9.0 Hours of Work**

Any hours employed in the performance of duties related to the designated occupation will be credited towards the completion of the term of apprenticeship. Appropriate documentation of these hours must be provided.

## **10.0 Copies of the Registration for Apprenticeship**

The Director of Apprenticeship and Trades Certification shall provide copies of the Registration for Apprenticeship form to all signatories to the document.

## **11.0 Ratio of Apprentices to Journeypersons**

Under normal practice, the ratio of apprentices to journeypersons shall not exceed two apprentices to every one journeyperson employed. Other ratio arrangements would be determined and approved by the PACB.

## **12.0 Relationship to a Collective Bargaining Agreement**

Where applicable in Section 5 of these conditions, Collective Agreements take precedence.

## **13.0 Amendments to a Plan of Apprenticeship Training**

A Plan of Training may be amended at any time by the PACB.

## **14.0 Employment, Re-Employment and Training Requirements**

- 14.1 The Plan of Training requires apprentices to regularly attend their place of employment.
- 14.2 The Plan of Training requires apprentices to attend training for that occupation as prescribed by the PACB.

- 14.3 Failure to comply with Sections 14.1 and/or 14.2 will result in cancellation of the Memorandum of Understanding. Apprentices may have their MOUs reinstated by the PACB but would be subject to a commitment to complete the entire program as outlined in the General Conditions of Apprenticeship. Permanent cancellation in the said occupation is the result of non-compliance.
- 14.4 Cancellation of the Memorandum of Understanding to challenge journeyperson examinations, if unsuccessful, would require an apprentice to serve a time penalty of two (2) years before reinstatement as an apprentice or qualifying to receive a class call to training as a registered Trade Qualifier. Cancellation must be mutually agreed upon by the employer and the apprentice.
- 14.5 An employer shall ensure that each apprentice is under the direct supervision of an approved journeyperson supervisor who is located at the same worksite as the apprentice, and that the apprentice is able to communicate with the journeyperson with respect to the task, activity or function that is being supervised.
- 14.6 Under the Plan of Training the employer is required to keep each apprentice employed as long as work is available, and if the apprentice is laid off due to lack of work, to give first opportunity to be hired before another is hired.
- 14.7 The employer will permit each apprentice to attend training programs as prescribed by the PACB.
- 14.8 Apprentices who cannot acquire all the workplace skills at their place of employment will have to be evaluated in a simulated work environment at a PACB authorized training institution and have sign-off done by instructors to meet the requirements for certification.

## **15.0 Appeals to Decisions Based on Conditions Governing Apprenticeship Training**

Persons wishing to appeal any decisions based on the above conditions must do so in writing to the Minister of Education and Early Childhood Development within 30 days of the decision.

**D. Requirements for Red Seal Endorsement**

1. Evidence the required work experiences outlined in this Plan of Training have been obtained. This evidence must be in a format clearly outlining the experiences and must be signed by an appropriate person or persons attesting that these experiences have been obtained to the level required.
2. Successful completion of all required courses in the program.
3. A combination of training from an approved training program and suitable work experience totaling 7200 hours.

**Or**

A total of 10,800 hours of suitable work experience. Completion of a National Red Seal examination, to be set at a place and time determined by the Apprenticeship and Trades Certification Division.

## E. Roles and Responsibilities of Stakeholders in the Apprenticeship Process

The apprenticeship process involves a number of stakeholders playing significant roles in the training of apprentices. This section outlines these roles and the responsibilities resulting from them.

### **The Apprentice:**

- completes all required technical training courses as approved by the PACB.
- finds appropriate employment.
- completes all required work experiences in combination with the required hours.
- ensures work experiences are well documented.
- approaches apprenticeship training with an attitude and commitment that fosters the qualities necessary for a successful career as a qualified journeyperson.
- obtains the required hand tools as specified by the PACB for each period of training of the apprenticeship program.

## **The Employer:**

- provides high quality work experiences in an environment conducive to learning.
- remunerates apprentices as set out in the Plan of Training or Collective Agreements.
- provides feedback to training institutions, Apprenticeship and Trades Certification Division and apprentices in an effort to establish a process of continuous quality improvement.
- where appropriate, releases apprentices for the purpose of returning to a training institution to complete the necessary technical courses.
- ensures work experiences of the apprentice are documented.
- ensures a certified journeyperson is currently on staff in the same trade area as the apprentice and whose certification is recognized by the NL Department of Education and Early Childhood Development.

## **The Training Institution:**

- provides a high quality learning environment.
- provides the necessary student support services that will enhance an apprentice's ability to be successful.
- participates with other stakeholders in the continual updating of programs.

## **The Apprenticeship and Trades Certification Division:**

- establishes and maintains program advisory committees under the direction of the PACB.
- promotes apprenticeship training as a viable career option to prospective apprentices and other appropriate persons involved, such as career guidance counsellors, teachers, parents, etc.
- establishes and maintains a protocol with training institutions, employers and other appropriate stakeholders to ensure the quality of apprenticeship training programs.
- ensures all apprentices are appropriately registered and records are maintained as required.
- schedules all necessary technical training periods for apprentices to complete requirements for certification.
- administers Level, provincial and Red Seal examinations.

## **The Provincial Apprenticeship and Certification Board:**

- sets policies to ensure the provisions of the **Apprenticeship and Certification Act (1999)** are implemented.
- ensures advisory and examination committees are established and maintained.
- accredits institutions to deliver apprenticeship training programs.
- designates occupations for apprenticeship training and/or certification.

Department of Education and Early Childhood Development  
Apprenticeship and Trades Certification Division

