

Machinist Level 1

Machinist

Unit: A1 Trade Safety Awareness (A & C Board Standard)

Level: One

Duration: 7 hours

Theory: 7 hours

Practical: 0 hours

Overview:

Safe working procedures and conditions, injury prevention, and the preservation of health are of primary importance to industry in Canada. These responsibilities are shared and require the joint efforts of government, employers, and employees. It is imperative that all parties become aware of circumstances that may lead to injury or harm. Safe learning experiences and environments can be created by controlling the variables and behaviours that may contribute to incidents or injury.

It is generally recognized that safety-conscious attitudes and work practices contribute to a healthy, safe, and incident-free working environment.

It is imperative to apply and be familiar with the Workplace Safety and Health Act and Regulations. As well, it's essential to determine workplace hazards and take measures to protect oneself, co-workers, the public, and the environment. Safety education is an integral part of Machinist apprenticeship training program both in school and on-the-job. Unit content is supplemented throughout Technical Training by trade-specific information about Machinist safety hazards and precautions presented in the appropriate contexts of discussion and study. Percentage of unit mark for each section is at the discretion of the instructor.

Objectives and Content:

**Percent of
Unit Mark (%)**

1. Identify safety and health requirements.

%

- a. Overview of *Workplace Health and Safety Act*:
 - Rights and responsibilities of employees under the Act.
 - Rights and responsibilities of employers.
 - Rights and responsibilities of supervisors under the Act.
- b. Fourteen (14) Regulations.
- c. Codes of Practice.
- d. Guidelines.
- e. Right to refuse.
- f. Explanation of right-to-refuse process:
 - Rights and responsibilities of employees under the Act.
 - Rights and responsibilities of employers.
 - Rights and responsibilities of supervisors under the Act.
 - Rights and responsibilities of employees under the Act.

- 2. Identify personal protective equipment (PPE) and PPE procedures.** %
- a. Employer and employee responsibilities as related to PPE.
 - b. Standards: CSA; ANSI, and Guidelines.
 - c. Work protective clothing and danger if it fits poorly.
 - d. Gloves – importance of proper selection for handling chemicals, cold items, etc.).
 - e. Headwear – Appropriate headwear when required and the approved type of head wear.
 - f. Eye protection – Comparison/contrast between eyeglasses, industrial safety glasses, and safety goggles.
 - g. Foot protection – standards/requirements for selection and use.
 - h. Hearing protection:
 - Noise hazards and noise-hazard rating standards (re: when protection is required).
 - Regulations.
 - Types of hearing protection.
 - i. Respiratory protection – Variety; standards for use and selection.
 - j. Fall-protection equipment standards – Manitoba standards and guidelines; ANSI (U.S. standards); etc.
 - k. Ladders and scaffolding.
 - l. Safety principles for working around hoisting, transport, and materials-handling equipment (e.g. boom trucks, forklifts, pallet trucks, semis, etc.).
- 3. Identify electrical safety.** %
- a. Effects of electric current on the human body.
 - b. Three factors that affect the severity of an electric shock.
 - c. The effects of electrical arc and blast of the human body and on equipment.
 - d. Hazards/precautions re: working with and/or around energized equipment.
- 4. Identify fire safety.** %
- a. Types of fires.
 - b. Types of fire-fighting equipment.
 - c. Classification of fire extinguishers (A, B, and C).
 - d. Location of fire extinguishers and fore exits.
 - e. Fire alarms and drills.
- 5. Identify ergonomics.** %
- a. Definition/scope of ergonomics as a field of knowledge.
 - b. Ergonomically hazardous conditions and precautions regarding:
 - Postures during work.
 - Repetitive activity/impacts.
 - Force.
 - Lifting.
 - Tool use.
 - Safety equipment.
 - Hand-tool accidents.
 - Equipment.
 - Materials handling (including lifting, carrying, and putting down a load).
- 6. Identify hazard recognition and control.** %
- a. Safe work practices.
 - b. Basic risk assessment.
 - c. Injury prevention and control measures.
 - d. Hazards/precautions re: use of pneumatic tools.

7. **Describe the hazards of confined-space entry.** %
- a. Definition and identification of confined space(s).
 - b. Confined space hazards:
 - Physical.
 - Biological.
 - c. Precautions when working in confined space.
 - d. Emergency Response Plan.
 - e. Self-Contained Breathing Apparatus (SCBA).
8. **Identify First Aid/Cardiopulmonary Resuscitation (CPR).** %
- a. Overview of First Aid Regulation.
 - b. Employer obligations re: First Aid:
 - Who is certified to provide First Aid?
 - What is to be done while awaiting First Aid?
 - Where is First Aid Kit?
 - c. Describe basic First Aid requirements and techniques:
 - Definition and scope/limits of First Aid interventions.
 - Procedure for specific intervention re: cuts; burns; abrasions; sprains, fractures; suffocation; shock; electrical shock.
 - Interface with other services and agencies (e.g. Workers' Compensation claims.)
 - d. Describe basic CPR requirements and techniques.
 - Definition and scope/limits of CPR interventions.
 - Varieties of CPR training and certification.
 - Obtaining certification.
9. **Identify safety requirements as they apply to the WHMIS.** %
- a. WHMIS as a system.
 - b. Manitoba provincial regulation under the Safety and Health Act; WHMIS in other provinces.
 - c. Federal Hazardous Product's Act.
 - d. WHMIS generic training, including:
 - Identification, use, and format of WHMIS information tools.
 - WHMIS and labeling by manufacturers, suppliers, and workplace sources.
 - Definition and hazards/precautions re hazardous materials.
 - Compliance with government safety standards and regulations.
 - e. WHMIS special-purpose certifications and associated rationale.
 - f. Typology of WHMIS labels, symbols, and classifications.
 - g. Scope and use of Materials Safety Data Sheets (MSDS).
10. **Describe the identification and control of specified hazards.** %
- a. Safe work procedures.
 - b. Importance and scope of industrial housekeeping requirements.
 - c. Employer responsibilities.
 - d. How/where to store materials.
 - e. Safety hazards/precautions re: walkways, stairs, floor/wall/roof openings, etc.
 - f. Safe work procedures.

Machinist

Unit: A2 Safety

Level: One

Duration: 7 hours

Theory: 7 hours

Practical: 0 hours

Overview:

This unit of instruction is designed to introduce knowledge of safety equipment, their applications, maintenance and procedures for use. It is also designed to introduce knowledge of safe work practices, and knowledge of regulatory requirements pertaining to safety.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Identify types of personal protective equipment (PPE) and describe their applications.	%
2. Describe the procedures used to care for and maintain PPE.	%
3. Identify types of fire extinguishing equipment and describe their applications and procedures for use.	%
4. Identify workplace hazards and describe safe work practices and equipment.	%
a. Personal	
b. Shop/facility	
• Energy state awareness (electrical and mechanical)	
• Lockout/tag out.	
• Ventilation/fumes.	
• Fire.	
c. Environment.	
• Discharge/spills.	
• Material waste.	
5. Identify and interpret workplace safety and health regulations.	%
a. Federal	
• Material Safety Data Sheets (MSDS)	
• Workplace Hazardous Material Information System (WHIMIS)	
a. Provincial/territorial	
• Occupational Health and Safety (OHS)	

Machinist

**Unit: A3 Orientation I:
The Structure & Scope of Machinist
Trade Learning (A & C Board Standard)**

Level: One

Duration: 7 hours

Theory: 7 hours

Practical: 0 hours

Overview:

Jobsite learning and teaching have long been fundamental to Machinist trade-practice, including its safety, health, and environmental implications. The chance to gain maximum benefit from workplace trade learning can be shaped by such complex factors as production schedules and jobsite politics. As adult trade-learners, Machinist apprentices at all levels of skill-development are encouraged to use their eyes, ears, prior knowledge, and interpersonal skills to encourage journeypersons to teach as well as to supervise them. This requires understanding the trade's dynamics, including the roles and responsibilities that order jobsite activity. Unit content outlines the trade's skill-requirements and long-term career possibilities. It includes suggestions about trade-related learning styles/strategies. It also introduces the concept of skills stewardship, stressing the obligations that apprentices incur in learning from journeypersons to 'pay it forward' by assisting other newcomers who will follow them into the trade. The unit's purpose is to provide this essential information about learning to learn as a Machinist apprentice. Elsewhere in Technical Training, senior apprentices explore the importance of learning to teach in trade workplaces – a central function of Machinist journeywork.

Objectives and Content:

Percent of Unit Mark (%)

1. Describe the structure and scope of the trade.

30%

- a. Historical background, including apprentice experiences
- b. Structure/scope of the trade
 - International and national characteristics
 - Important features of practicing the trade in Manitoba
 - Trade and industry organizations
 - Generalists and specialists
 - Lead hands and other immediate supervisors
 - Geographic mobility
 - Job hierarchies and innovations

2. Describe the Manitoba Machinist Apprenticeship Program.

40%

- a. Concept and significance of skills stewardship
 - To the trade
 - To apprentices
 - To journeypersons
 - To employers

- b. Practical Training: on-site component of program
 - Roles/responsibilities of employer and journeyperson(s)
 - Roles/responsibilities of Training Coordinator
 - Roles/responsibilities of apprentice, including record-keeping re: job experience
- c. Technical Training: off-site component of program
 - Roles/responsibilities of instructors (including Related'-area faculty)
 - Roles/responsibilities of apprentices
- d. Attendance requirements
- e. Progression requirements
- f. Reporting of grades
- g. Other (as may be specified by instructor)

3. Describe special opportunities and challenges re: Machinist training.

40%

- a. Adapting personal learning goals to program contexts
 - Principles of adult learning (including importance of self-direction)
 - Description/recognition of learning and teaching styles
 - Significance of work culture and interpersonal skills re: trade-learning
 - Integrating Technical Training and Practical Training content
 - Possibilities and perils of peer learning
 - Budgeting and other necessary personal arrangements
 - Identifying sources of support (e.g. upgrading trade-related math skills)
- b. On-site learning challenges and opportunities
 - Significance of jobsite supervision roles and teaching styles (e.g. journey-level skills-coach vs. mentor)
 - Communication with journeypersons and employers
 - Coverage of prescribed tasks/subtasks that define the scope of trade, and the content of the certification exam administered to apprentices who are completing their program
 - Getting help and fixing mistakes
 - Maintaining personal record of trade-learning challenges/achievements (e.g. a learning journal, and/or a personal training plan, if possible, discussed with employers and others supporting the apprenticeship journey to certification)
- c. In-school opportunities/challenges
 - Personal arrangements that support progress in Technical Training
 - "Baggage-handling" – self-assessing potential impacts of previous experiences (favourable/unfavourable) on current learning; availability of supports
 - Techniques for note-taking, record-keeping, and review
 - Relations with instructors (including 'Related'-area faculty)
 - College resources (library, support services, etc.)

Machinist

Unit: A4 Hand Threading

Level: One

Duration: 10 hours

Theory: 6 hours

Practical: 4 hours

Overview:

This unit of instruction is designed to introduce knowledge of basic threads, and fits, and their applications. It is also designed to introduce knowledge of the procedures used to measure and gauge threads.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with threads.	5%
2. Identify hazards and describe safe work practices pertaining to threading.	5%
3. Identify types of threads and describe their purpose and applications.	30%
4. Explain thread fit, classifications and series.	5%
5. Identify types of thread inserts and describe their applications and installation procedures.	5%
6. Describe the importance of thread fit and the use of thread gauges.	10%
7. Identify types of thread failures and describe their causes and remedies.	5%
8. Calculate and select tap drill sizes in metric and imperial.	10%
9. Identify methods used to measure and gauge threads and describe their associated procedures.	5%
10. Describe the procedures used to produce threads using taps and dies.	5%
11. Perform procedures used to cut or tap a thread.	15%

Machinist

Unit: A5 Hoisting, Lifting and Rigging

Level: One

Duration: 7 hours

Theory: 3 hours

Practical: 4 hours

Overview:

This unit of instruction is designed to introduce knowledge of hoisting, lifting and rigging equipment, their applications, limitations and procedures for use. It is also designed to introduce knowledge of basic hoisting, lifting and rigging techniques.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with hoisting, lifting and rigging.	10%
2. Identify hazards and describe safe work practices pertaining to hoisting, lifting and rigging.	30%
3. Identify codes and regulations pertaining to rigging, hoisting and lifting. a. Training and certification requirements.	5%
4. Identify types of rigging equipment and accessories and describe their applications, limitations and procedures for use. a. Ropes. b. Slings. c. Chains. d. Hooks. e. Spreader bars. f. Shackles.	5%
5. Identify and interpret hand signals used for hoisting and lifting.	5%
6. Identify types of hoisting and lifting equipment and accessories and describe their applications, limitations and procedures for use.	10%
7. Describe the considerations when rigging material/equipment for lifting. a. Load characteristics. b. Equipment and accessories. c. Environmental factors. d. Anchor points. e. Sling angles.	5%

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| 8. | Describe the procedures used to inspect, maintain and store hoisting, lifting and rigging equipment. | 10% |
| 9. | Perform procedures used to inspect, maintain and store hoisting, lifting and rigging equipment. | 20% |

Machinist

Unit: A6 Basic Drawings

Level: One

Duration: 32 hours

Theory: 32 hours

Practical: 0 hours

Overview:

This unit of instruction is designed to introduce knowledge of basic drawings and their applications. It is also designed to introduce knowledge of interpreting and extracting information from drawings.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with drawings.	20%
a. Nominal size.	
b. Limits.	
c. Tolerance.	
d. Allowance.	
e. Scale.	
f. Symmetry.	
2. Identify types of basic drawings and sketches and describe their purpose.	10%
3. Interpret and extract information from drawings.	50%
a. Lines.	
b. Projections.	
c. Dimensions.	
d. Notes.	
e. Lay/surface finish symbols.	
f. Welding symbols	
4. Explain the principles of orthographic projection.	10%
5. Describe basic sketching techniques.	10%

Machinist

Unit: A8 Fluids and Coolants

Level: One

Duration: 7 hours

Theory: 5 hours

Practical: 2 hours

Overview:

This unit of instruction is designed to introduce knowledge of cutting fluids, their applications, and procedures for use. It is also designed to introduce knowledge of coolants, their applications and procedures for use. In addition, it will introduce knowledge of lubricants, their applications and procedures for use. It will introduce knowledge of solvents, their applications and procedures for use.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with fluids and coolants.	10%
2. Identify hazards and describe safe work practices pertaining to fluids and coolants.	15%
a. Personal.	
b. Shop/facility.	
c. Environmental.	
3. Interpret regulations pertaining to the use of fluids and coolants.	5%
4. Identify types of fluids and coolants and describe their purpose, characteristics and applications.	10%
a. Cutting fluids.	
b. Coolants.	
c. Lubricants.	
d. Solvents.	
5. Describe the procedures used to apply and maintain lubricants.	5%
6. Perform procedures used for mixing, maintaining and adjusting coolants.	20%
7. Describe the procedures used to apply cutting fluids and coolants.	5%
8. Describe the procedures used to handle, store and dispose of fluids and coolants.	10%
a. Cutting fluids.	
b. Coolants.	
c. Lubricants.	
9. Perform procedures used to handle, store and dispose of fluids and coolants.	20%

Machinist

Unit: B1 Hand and Power Tools

Level: One

Duration: 22 hours

Theory: 10 hours

Practical: 12 hours

Overview:

This unit of instruction is designed to introduce knowledge of hand tools, their applications, maintenance and procedures for use. It is also designed to introduce knowledge of power tools, their applications, maintenance and procedures for use.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Identify hazards and describe safe work practices pertaining to hand and power tools.	10%
2. Identify types of hand tools and describe their applications and procedures for use.	10%
a. Vices.	
b. Hammers.	
c. Screw drivers.	
d. Wrenches.	
e. Pliers.	
f. Punches.	
g. Stamps.	
h. Hacksaws.	
i. Files.	
j. Scrapers.	
k. Deburring tools.	
l. Chisels.	
m. Taps.	
n. Dies.	
o. Arbor press.	
p. Extractors.	
3. Describe the procedures used to inspect, maintain and store hand tools.	10%
4. Perform the procedures used to inspect, maintain and store hand tools.	25%

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| 5. Identify types of power tools and equipment and describe their applications and procedures for use. | 10% |
| a. Electrical. | |
| b. Cordless. | |
| c. Hydraulic. | |
| d. Pneumatic. | |
| 6. Describe the procedures used to inspect, maintain and store power tools and equipment. | 10% |
| 7. Perform procedures used to inspect, maintain and store power tools and equipment. | 25% |

Machinist

Unit: B4 Drills and Drill Presses

Level: One

Duration: 15 hours

Theory: 7 hours

Practical: 8 hours

Overview:

This unit of instruction is designed to introduce knowledge of drills and drill presses, their applications, maintenance and procedures for use.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with drills and drill presses.	5%
2. Identify hazards and describe their safe work practices pertaining to drills and drill presses.	10%
3. Identify types of drills and describe their applications.	5%
4. Identify types of drill presses and describe their components and application.	5%
5. Identify drill press accessories and describe their applications and procedures for use.	5%
a. Jigs and fixtures.	
b. Work holding devices.	
c. Tool holding devices.	
6. Describe the procedures used to set up and perform drill press operations.	5%
a. Drilling.	
b. Counterboring.	
c. Countersinking.	
d. Tapping.	
e. Reaming.	
7. Describe the procedures used to inspect, maintain and store drilling equipment and accessories.	10%
8. Perform procedures used to sharpen drill bits.	10%
9. Describe the considerations to determine speed, feed and depth of cut for drill press operations.	10%

10. Perform set up and drill press operations.

30%

- a. Drilling.
- b. Counterboring.
- c. Countersinking.
- d. Tapping.

Machinist

Unit: C1 Precision Measurement I

Level: One

Duration: 15 hours

Theory: 10 hours

Practical: 5 hours

Overview:

This unit of instruction is designed to introduce knowledge of basic precision measurement and its use. It is also designed to introduce knowledge of basic precision measuring instruments, their applications and procedures for use.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with basic precision measurement.	10%
2. Describe the imperial and metric measuring systems and the procedures used to perform conversions for machining operations.	10%
3. Describe the procedures used to read basic precision measuring instrument scales.	10%
4. Identify types of precision measuring instruments and describe their applications and procedures for use. a. Micrometers. b. Vernier calipers. c. Dial indicators. d. Gauges.	10%
5. Describe the procedures used to perform basic calibration of measuring instruments.	10%
6. Describe the procedures used to inspect, maintain and store basic precision measuring instruments.	10%
7. Demonstrate applications and procedures when inspecting, maintaining and storing precision measuring instruments.	40%

Machinist

Unit: C3 Basic Layout

Level: One

Duration: 148 hours

Theory: 8 hours

Practical: 6 hours

Overview:

This unit of instruction is designed to introduce knowledge of basic layout and its use. It is also designed to introduce knowledge of basic layout tools and equipment, their applications, maintenance and procedures for use. In addition, it will introduce the procedures used to perform a basic layout.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with basic layout.	5%
2. Identify types of basic layout tools, equipment and accessories and describe their applications and procedures for use.	10%
a. Surface tables.	
b. Angle planes.	
c. Scribes.	
d. Dividers and trammels.	
e. Hermaphrodite calipers.	
f. Squares.	
g. Gauges.	
h. Rulers.	
3. Identify types of layout media/solutions and describe their applications.	5%
4. Calculate layout dimensions and reference points.	20%
5. Describe the procedures used to read and transfer sizes from a drawing.	5%
6. Describe the procedures used to perform basic layout.	5%
7. Identify methods used to mark workpieces for identification and describe their associated procedures.	5%
8. Describe the procedures used to inspect, maintain and store layout tools and equipment.	5%
9. Perform basic layout.	40%

Machinist

Unit: D1 Introduction to Conventional Lathes

Level: One

Duration: 20 hours

Theory: 20 hours

Practical: 0 hours

Overview:

This unit of instruction is designed to introduce knowledge of lathes, their accessories, attachments and applications. It is also designed to introduce knowledge of lathe tools and their applications

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with conventional lathes.	10%
2. Identify types of conventional lathes and describe their operating principles and applications.	5%
3. Identify the components and controls of conventional lathes and describe their purpose and operation.	10%
4. Identify conventional lathe accessories and attachments and describe their applications.	10%
5. Identify types of tool holding devices and describe their applications.	5%
6. Identify types of work holding devices and describe their applications.	10%
a. Four jaw chuck	
b. Three jaw chuck	
c. Face plate	
d. Between centres	
7. Identify types of conventional lathe tools and describe their characteristics and applications.	30%
a. Turning.	
b. Boring	
c. Threading.	
d. Grooving.	
e. Facing.	
f. Knurling.	
g. Parting off.	
h. Reaming.	
i. Tool post grinding.	
j. Drilling.	

- 8. Describe the procedures used to sharpen conventional lathe cutting tools. 10%
- 9. Describe the procedures used to grind cutting tool angles. 10%

Machinist

Unit: D2 Basic Conventional Lathe Operation

Level: One

Duration: 100 hours

Theory: 20 hours

Practical: 80 hours

Overview:

This unit of instruction is designed to introduce knowledge of conventional lathes, their maintenance and procedures for use.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Identify hazards and describe safe work practices pertaining to conventional lathe.	5%
2. Describe the considerations to determine speed, feed and depth of cut for conventional lathe operations.	5%
3. Calculate speed, feed and depth of cut.	5%
4. Identify potential set up problems and describe their causes and remedies.	5%
5. Describe the procedures used to set up lathes.	5%
6. Describe the procedures used to mount and adjust rests.	5%
7. Identify cutting fluids and coolants used during lathe operations.	2%
8. Identify the considerations and requirements for selecting tools and accessories for specific operations.	8%
9. Describe the procedures used to adjust and maintain conventional lathes.	2%
10. Describe the procedures used to align lathe centres.	5%
11. Describe the procedures used to perform basic conventional lathe operations.	10%
a. Turning.	
b. Boring.	
c. Threading.	
d. Grooving.	
e. Facing.	
f. Knurling.	

- g. Parting off.
- h. Reaming.
- i. Drilling.
- j. Set up lathe.
- k. Mount and adjust rests.

- | | |
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| 12. Describe the procedures used to set up eccentrics on conventional lathes. | 3% |
| 13. Identify techniques used to troubleshoot conventional lathe operations and describe their associated procedures. | 2% |
| 14. Describe the procedures used to inspect and maintain conventional lathes. | 3% |
| 15. Perform basic lathe operations. | 35% |

Machinist

Unit: D3 Advanced Lathe Drilling, Boring, Reaming, Tapping and Die Threading

Level: One

Duration: 25 hours

Theory: 15 hours

Practical: 10 hours

Overview:

This unit of instruction is designed to introduce knowledge of conventional lathe drilling, boring, reaming, tapping, and die threading operations.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Describe the procedures used for spotting and drilling work on a conventional lathe.	5%
2. Identify types of boring tools and describe their applications and procedures for use.	5%
3. Describe the procedures used for boring work on a conventional lathe.	5%
4. Identify types of machine reamers and describe their applications and procedures for use.	10%
5. Describe the procedures used for reaming work on a conventional lathe.	10%
6. Identify types of machine taps and dies and describe their applications and procedures for use.	10%
7. Describe the procedures used for tapping on a conventional lathe.	10%
8. Describe the procedures used for die threading on a conventional lathe.	10%
9. Describe the procedures used for counterboring and countersinking work on a conventional lathe.	10%
10. Describe speed, feed and depth of cut for conventional lathe operations.	10%
a. Reaming.	
b. Drilling.	
c. Tapping.	
d. Die threading.	
e. Counterboring.	
f. Countersinking.	
11. Perform processes for speed, feed and depth of cut for conventional lathe operations.	15%

Machinist

Unit: E1 Introduction to Milling Machines

Level: One

Duration: 20 hours

Theory: 20 hours

Practical: 0 hours

Overview:

This unit of instruction is designed to introduce knowledge of milling machines, their accessories, attachments and applications. In addition, it will introduce knowledge of milling cutting tools and their applications.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with milling machines.	10%
2. Identify hazards and describe safe work practices pertaining to conventional milling machines.	10%
3. Identify types of milling machines and describe their applications.	10%
a. Vertical.	
b. Horizontal/universal.	
c. Ram and turret.	
d. Horizontal boring mill.	
e. Vertical boring mill.	
4. Identify the components and controls of milling machines and describe their purpose and operation.	10%
5. Identify types of milling machine accessories and attachments and describe their applications and maintenance.	10%
6. Identify types of tool holding devices and describe their applications.	10%
7. Identify types of work holding devices and describe their applications and maintenance.	10%
8. Identify types of materials used in milling cutter construction and describe their characteristics.	10%
9. Identify types of cutting tools and describe their applications.	10%
10. Describe climb and conventional milling.	10%

Machinist

Unit: F1 Introduction to Grinding Machines

Level: One

Duration: 7 hours

Theory: 3 hours

Practical: 4 hours

Overview:

This unit of instruction is designed to introduce knowledge of grinding machines, their applications and procedures for use. In addition, it will introduce knowledge of offhand (bench) grinding operations. It will introduce knowledge of special (form) grinding operations.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with grinding machines.	10%
2. Identify hazards and describe safe work practices pertaining to grinding machines.	10%
3. Identify types of work holding devices and describe their applications.	10%
4. Identify types of grinding machines and accessories and describe their applications. a. Pedestal. b. Surface. c. Cylindrical. d. Centreless. e. Tool and cutter grinder.	20%
5. Describe the procedures used to perform offhand (bench) grinding operations.	10%
6. Perform offhand (bench) grinding operations	20%
7. Describe the procedures used to perform special (form) grinding operations.	10%
8. Perform procedures for changing and dressing a grinding wheel.	10%
