

Tool and Die Maker Level 1

Tool and Die Maker

Unit: A1 Trade Safety Awareness

Level: One

Duration: 7 hours

Theory: 7 hours

Practical: 0 hours

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 accident-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 Tool and Die Maker apprenticeship training both in school and on-the-job. Unit content is supplemented throughout technical training by trade-specific information about Tool and Die Maker safety hazards and precautions presented in the appropriate contexts of discussion and study. **Note: No percentage-weightings for test purposes are prescribed for this unit's objectives. A "Pass/Fail" grade will be recorded for the unit. A Pass mark is assumed to be 70%. Therefore 70% is the mark to be submitted to the Apprenticeship Branch clerks for inputting into computer records.**

Objectives and Content:	Percent of Unit Mark (%)
1. Identify safety and health requirements:	n/a
a. Overview of The Workplace Safety and Health Act. <ul style="list-style-type: none">• Rights and responsibilities of employees under the Act.• Rights and responsibilities of employers under the Act.• Rights and responsibilities of supervisors under the Act.	
b. Fourteen (14) regulations.	
c. Codes of practice.	
d. Guidelines.	
e. Right to refuse: <ul style="list-style-type: none">• Explanation of right to refuse process.• Rights and responsibilities of employees.• Rights and responsibilities of employers.• Rights and responsibilities of supervisors under the Act.	
2. Identify personal protective equipment (PPE) and procedures:	n/a
a. Employer and employee responsibilities as related to personal protective equipment.	
b. Standards: ANSI (U.S.A. standards), etc.	
c. Work protective clothing and danger if it fits poorly.	
d. Gloves – Importance of proper glove selection (when handling chemicals, cold items, slivers, etc.).	

- e. Headwear – appropriate protective headwear when required and the approved type of headwear.
 - f. Eye protection – comparison and distinction of everyday eyeglasses, industrial safety glasses and safety goggles.
 - g. Foot protection – when required according to safety standards.
 - h. Hearing protection:
 - Hazards of various noise levels (hearing protection must be worn).
 - Laws.
 - Types of hearing protection.
 - i. Respiratory protection – types, overview of proper selection.
 - j. Fall protection – Manitoba requirements standards guidelines
 - ANSI (U.S.A. standards), etc.
 - k. Ladders and scaffolding.
 - l. Safety principles for working with or around industrial trucks site-specific (forklifts, pallet trucks, etc.).
- 3. Identify regulations pertinent to care and cleanliness in the working area.** n/a
- 4. Identify the regulations relevant to the safe use of chemicals.** n/a
- 5. Identify regulations governing the use of scaffolding.** n/a
- 6. Identify regulations governing the use of ladders and related equipment.** n/a
- 7. Identify ergonomics:** n/a
- a. Definition of ergonomics and conditions that may affect the body.
 - Working postures.
 - Repetition.
 - Force.
 - Lifting.
 - Tools.
 - Identify tool and safety equipment.
 - Causes of hand tool accidents.
 - Equipment.
- 8. Hazard recognition and control:** n/a
- a. HPA and HPR. Hazardous Products Act and Hazardous Products Regulations.
 - b. Safe work practices.
 - c. Basic risk assessment.
 - d. Injury prevention and control measures.
 - e. Identification of hazards involved in pneumatic tool use and explanation of how to guard against them.
 - f. Refrigerants.
 - g. Toxic chemical (non-refrigerant).
 - h. High pressure fluids.
- 9. Hazard of confined space entry:** n/a
- a. Identification of a confined space.
 - b. Hazards of a confined space (including physical and biological hazards).
 - c. Working in a confined space.
 - d. Emergency response plan.
 - e. Self-contained breathing apparatus (SCBA).
- 10. Identify first aid/CPR:** n/a

- a. Overview of first aid regulation.
 - b. Obligations of employers regarding first aid:
 - Who is certified to provide first aid?
 - What to do while waiting for help?
 - Where is the first aid kit located?
 - c. Describe basic first aid requirements and techniques:
 - Scope and limits of first aid intervention.
 - Specific interventions (cuts, burns, abrasions, fractures, suffocation, shock, electrical shock, etc.).
 - What is it?
 - Interface with other services and agencies (e.g., Workers Compensation claims).
 - d. Describe basic CPR requirements and techniques:
 - How do you get certified?
 - Scope and limits of CPR intervention (include varieties of CPR certification).
- 11. Identify the safety requirements as they apply to WHMIS 2015 with emphasis on:** n/a
- a. WHMIS 1988 vs 2015 as system. What is same and what has changed? What is GHS?
 - b. Provincial regulation under the Safety and Health Act:
 - Each province has a WHMIS regulation.
 - c. Federal Hazardous Products Act.
 - d. WHMIS generic training:
 - WHMIS defined and the format used to convey information about hazardous materials in the workplace.
 - Information found on supplier and workplace labeling using WHMIS.
 - Hazardous materials in accordance with WHMIS.
 - Compliance with government safety standards and regulations.
 - e. Description of WHMIS (include varieties of WHMIS Certification):
 - Typology of WHMIS labels, symbols, and classifications.
 - Scope and use of Materials/Safety Data Sheets (M/SDS).
- 12. Identifying and controlling hazards:** n/a
- a. Basic control measures (injury prevention).
 - b. Safe work procedures.
 - c. Explanation on the importance of industrial housekeeping.
 - d. Employer responsibilities.
 - e. How and where to store materials.
 - f. Safety measures related to walkways, stairs and floor openings.
 - g. Explanation of how to protect the worker and others when working in traffic paths.
- 13. Describe the safe storage of stock equipment in service vehicles.** n/a
- 14. Discuss transportation of dangerous goods.** n/a
- 15. Describe Asbestos Safety and Health Requirements:** n/a
- a. Describe what asbestos is, and why it has been used so much.
 - b. Describe the potential health hazards associated with asbestos.
 - c. Identify typical products and materials that contain asbestos.
 - d. Describe proper precautions and work practices when working around asbestos.
 - e. Describe how to recognize asbestos hazards due to damage or deterioration.
 - f. Describe appropriate response to an asbestos fiber release.
 - g. Describe what Workplace Safety and Health regulations, guidelines and bulletins apply to workers who work with or work around asbestos and what aspects of those regulations, guidelines and bulletins affect you or your company.

16. **Review the amendments to The Workplace Safety and Health Regulation to meet harmonization recommendations of the Occupational Safety and Health of the Canadian Association of Administrators of Labour Legislation, a cross-jurisdictional advisory and consultative body respecting shared issues relating to occupational safety and health which include:** n/a
- a. Updating first-aid kits and first-aid certifications in accordance with newly developed Canadian Standards Association standards as part of a national system for workplace first aid;
 - b. extending baseline hearing test requirements from within 70 days of hire to up to six months and replace annual hearing reports with requirements to report every two years;
 - c. clarifying existing requirements for the provision and use of several types of personal protective equipment including high-visibility safety apparel, hearing protection, life jackets and personal flotation devices; and
 - d. ensuring a secondary air supply is carried on the person or within arm's reach for workers working in dangerous atmospheres.

Tool and Die Maker

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. Percentage of unit mark for each section is at the discretion of the instructor.

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).	

Tool and Die Maker

Unit: A3 Learning About Work

Level: One

Duration: 7 hours

Theory: 7 hours

Practical: 0 hours

Overview:

One sign that an apprentice has become competent in a task or technique is to be asked to share this knowledge. Jobsite skills-exchange has long been fundamental to trade-learning. Even trade veterans rely on peers to refine their knowledge and skill. The opportunity to benefit from this process, however, is shaped by complex factors that include jobsite 'politics' and industrial/construction deadlines. As adult trade-learners, apprentices at all levels of training must use their observational, listening and interpersonal skills to benefit from the journey person's knowledge and experience. This requires understanding the trade's dynamics, as well as the roles and responsibilities which order workplace/jobsite work-life.

This unit profiles the trade's structure and scope as determined by the Apprenticeship and Certification Act, regulations, Provincial Advisory Committees and the Red Seal Occupational Standard (RSOS) from which the training standards are derived (core tasks and skill requirements), as well as its job-ladders and long-term career options and social competencies. This includes information about major areas of working knowledge, activities and interactions at work, and expansive and restrictive workplaces, stressing their application to apprenticeship on-the-job training.

A sound grasp of the roles, workplace relationships, and possibilities introduced in this unit are part of 'learning to learn' in Manitoba's apprenticeship system. Senior apprentices are later offered information about learning to *teach* in this system – a central and time-honored foundation of Trades journeywork.

Objectives and Content:

Percent of Unit Mark (%)

- | | |
|---|------------|
| 1. Describe structure and scope of the Tool and Die Maker trade: | 60% |
| a. The Apprenticeship and Certification Act. | |
| • Apprenticeship and Certification Board and Provincial Advisory Committees. | |
| • General and specific trade regulation. | |
| • Policies regarding attendance, evaluation procedures, conduct and progression requirements (Apprenticeship Manitoba, Training provider). | |
| b. Uses of the Red Seal Occupational Standard (RSOS): | |
| • Technical training in-school curriculum. | |
| • On-the-job record book of hours (Manitoba blue book). | |
| • Examinations (level placement tests, final certification examinations). | |
| c. Opportunities and future career options: | |
| • Generalists and specialists. The move toward specialization is well known to modern tradespeople. Some prefer to specialize and others want to do it all. Supervisory positions require a broad scope. | |
| • Lead hands and other immediate supervisors. Apprentices need to know how to become a lead-hand as much as they need to know the benefits and pit-falls of leadership between management and shop floor workers. | |

- Geographic mobility. What does it mean to a construction/industrial worker to have to travel to find work? Are there more opportunities if they do? What are they? What are the draw-backs to being away from home for several weeks at a time?
- Job hierarchies and innovations. What trade specific special training opportunities are available in your trade? Is there travel involved? Is there an opportunity to move up the ladder on a work crew as opposed to staying in the shop?

2. Describe two levels of workplace competency: 30%

- a. Job competencies related to workplace culture.
 - Knowledge of workplace equipment and materials.
 - Skills and techniques.
- b. Social competencies related to workplace culture:
 - Frame of reference for evaluation workplace events.
 - Language of work.
 - Workplace belief systems.
 - Rules and meanings.
 - Multiculturalism and equity in the workplace.

3. Describe accommodation for apprentices with disabilities: 10%

- a. Technical training:
 - Requirements.
 - Roles and responsibilities.
 - Services and information required by persons with disabilities.
- b. On-the-job:
 - Requirements.
 - Roles and responsibilities.
 - Services and information required by persons with disabilities.

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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%

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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:	5%
a. Training and certification requirements.	
4. Identify types of rigging equipment and accessories and describe their applications, limitations and procedures for use:	5%
a. Ropes.	
b. Slings.	
c. Chains.	
d. Hooks.	
e. Spreader bars.	
f. Shackles.	
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:	5%
a. Load characteristics.	
b. Equipment and accessories.	
c. Environmental factors.	
d. Anchor points.	
e. Sling angles.	

- 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%**

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Unit: A6 Basic Drawings

Level: One

Duration: 28 hours

Theory: 28 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%

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Unit: A7 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%

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Unit: A8 Hand and Power Tools

Level: One

Duration: 21 hours

Theory: 7 hours

Practical: 14 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: <ul style="list-style-type: none">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	10%
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%
5. Identify types of power tools and equipment and describe their applications and procedures for use: <ul style="list-style-type: none">a. Electrical.	10%

- 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%

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Unit: A9 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: a. Jigs and fixtures. b. Work holding devices. c. Tool holding devices.	5%
6. Describe the procedures used to set up and perform drill press operations: a. Drilling. b. Counterboring. c. Countersinking. d. Tapping. e. Reaming.	5%
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.

Tool and Die Maker

Unit: A10 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: <ul style="list-style-type: none"> 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%

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Unit: A11 Basic Layout

Level: One

Duration: 14 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%

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Unit: A12 Introduction to Conventional Lathes

Level: One

Duration: 21 hours

Theory: 21 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%

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Unit: A13 Basic Conventional Lathe Operation

Level: One

Duration: 105 hours

Theory: 21 hours

Practical: 84 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.

- | | |
|---|------------|
| 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% |

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Unit: A14 Advanced Lathe Drilling, Boring, Reaming, Tapping and Die Threading

Level: One

Duration: 24 hours

Theory: 14 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%**

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Unit: A15 Introduction to Milling Machines

Level: One

Duration: 27 hours

Theory: 27 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. Knowledge of reciprocating machines, slotters, shapers, broaching and keyseating machines.	10%

- a. Terminology associated with reciprocating machines.
- b. Hazards and safe work practices pertaining to reciprocating machines.
- c. Types of slotters and their components and applications.
- d. Markings and documentation relating to material selection.
- e. Procedures used to set up and operate slotters.
- f. Procedures used to set up and operate shapers.
- g. Operating principles of machine broaching and keyseating.
- h. Types of broaching and keyseating machines and their applications.
- i. Types of tooling for broaching and keyseating machines and their applications.
- j. Procedures used to set up and operate broaching and keyseating machines.
