



PROVINCIAL PLAN OF TRAINING FOR THE MACHINIST OCCUPATION

Document Status	Date Distributed	Mandatory Implementation Date	Comments
Original Version	April 2005		

March 2005

Preface

This Provincial Plan of Training is based on the 1998 edition of the National Occupational Analysis for the Machinist trade. It was developed through the cooperative efforts of the Atlantic Apprenticeship Council, which consists of both the Atlantic Directors of Apprenticeship and Apprenticeship Board Chairs. This document describes the curriculum content for the Machinist apprenticeship training program and outlines each of the technical training units necessary for completion of apprenticeship.

Acknowledgement

Advisory committees, industry representatives, instructors and apprenticeship staff provided valuable input to the development of this Apprenticeship Training Standard. Without their dedication to quality apprenticeship training, this document could not have been produced. A sincere thank you.

Table of Contents

Preface	i
Acknowledgment	ii
Evaluation Form	iii
Conditions Governing Apprenticeship Training	1
Requirements for Red Seal Certification	7
Roles and Responsibilities of Stakeholders in the Apprenticeship Process	8
Program Outcomes	10
Program Content	12
Program Structure	14
*Math	113
REQUIRED RELATED COURSES	
Workplace Communications	116
Customer Service	118
Quality Assurance/Quality Control	120
Introduction to Computers	122
Workplace Skills	126
Job Search Techniques	128
Entrepreneurial Awareness	130

CONDITIONS GOVERNING APPRENTICESHIP TRAINING

1.0 GENERAL

The following general conditions will apply to all apprenticeship training programs approved by the Provincial Apprenticeship and Certification Board in accordance with the Apprenticeship Training and Certification Act. Where an occupation requires additional conditions, these will be noted in the specific plan of training for that occupation. In no case should there be a conflict between these conditions and the additional requirements specified in certain plans of training.

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 this 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 particular plans of training. Mature students, at the discretion of the Director of Institutional and Industrial Education, 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 Institutional and Industrial Education, credit towards the apprenticeship program may be awarded to an apprentice for previous work experience and/or training as validated through prior learning assessment.

2.4 A Registration for Apprenticeship form must be duly completed.

3.0 PROBATIONARY PERIOD

The probationary period for each memorandum of understanding will be six months. Within that period the memorandum may be terminated by either party upon giving the other party and the Provincial Apprenticeship and Certification Board one week notice in writing.

4.0 TERMINATION OF A MEMORANDUM OF UNDERSTANDING

After the probationary period referred to in Section 3.0 herein, the memorandum of understanding may be terminated by the Board by mutual consent of the parties thereto or cancelled by the Board for proper and sufficient cause in the opinion of the Board.

5.0 APPRENTICESHIP PROGRESSION SCHEDULE AND WAGE RATES

5.1 Progression Schedule

7200 Hour Programs	Requirements for Progression	Progress To
First Year Apprentice	Completion of entry level (Block 1) courses, plus relevant work experience totaling a minimum of 1800 hours *	Second Year
Second Year Apprentice	Completion of advanced level (Block 2) courses, plus relevant work experience totaling a minimum of 3600 hours	Third Year
Third Year Apprentice	Completion of advanced level (Block 3) courses, plus relevant work experience totaling a minimum of 5400 hours	Fourth Year
Fourth Year Apprentice	Completion of advanced level (Block 4) courses and (Block 5) <i>if applicable</i> , plus sign-off of workplace skills required for certification totaling a minimum of 7200 hours**	Write Certification Examination
5400 Hour Programs	Requirements for Progression	Progress To
First Year Apprentice	Completion of entry level (Block 1) courses, plus relevant work experience totaling a minimum of 1800 hours *	Second Year
Second Year Apprentice	Completion of advanced level (Block 2) courses, plus relevant work experience totaling a minimum of 3600 hours	Third Year
Third Year Apprentice	Completion of advanced level (Block 3) courses, plus sign-off of workplace skills required for certification totaling a minimum of 5400 hours	Write Certification Examination

4800 Hour Programs	Requirements for Progression	Progress To
First Year Apprentice	Completion of entry level courses (Block 1) courses, plus relevant work experience totaling a minimum of 1600 hours *	Second Year
Second Year Apprentice	Completion of advanced level (Block 2) courses, plus relevant work experience totaling a minimum of 3200 hours	Third Year
Third Year Apprentice	Completion of advanced level (Block 3) courses, plus sign-off of workplace skills required for certification totaling a minimum of 4800 hours	Write Certification Examination

* All direct entry apprentices must meet the **Requirements for Progression** either through Prior Learning Assessment and Recognition or course completion before advancing to the next year.

** Apprentices in a 7200 hour program which incorporates more than four blocks of training are considered fourth year apprentices pending completion of 100% course credits and workplace skills requirements.

5.2 For the duration of each Apprenticeship Training Period, the apprentice, who is not covered by a collective agreement, shall be paid a progressively increased schedule of wages which shall not be less than:

Program Duration	Wage Rates		Comments
7200 Hours	1 st Year	55%	These wage rates are percentages of the prevailing journeyperson's wage rate in the place of employment of the apprentice. No apprentice shall be paid less than the wage rate established by the Labour Standards Act (1988), as now in force or as hereafter amended, or by other Order, as amended from time to time replacing the first mentioned Order.
	2 nd Year	65%	
	3 rd Year	75%	
	4 th Year	90%	
5400 Hours and 4800 Hours	1 st Year	55%	
	2 nd Year	70%	
	3 rd Year	85%	
4000 Hours	(Hairstylist Program) - The apprentice shall be paid no less than the minimum wage for hours worked and a commission agreed upon between the apprentice and the employer.		

6.0 TOOLS

Apprentices shall be required to obtain hand tools as and when specified by the Board.

7.0 PERIODIC EXAMINATIONS AND EVALUATION

- 7.1 Every apprentice shall submit to such occupational tests and examinations as the Board shall direct. If after such occupational tests and examinations the apprentice is found to be making unsatisfactory progress, his/her rate of wage shall not be advanced as provided in Section 5 until his/her progress is satisfactory to the Director of Institutional and Industrial Education 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 Board 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. At the discretion of the instructor, the summative mark may be for completion of a theory examination or a combination of the theory examination and an assigned practical project.

8.0 GRANTING OF CERTIFICATES OF APPRENTICESHIP

Upon the successful completion of apprenticeship, the Board 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 Institutional and Industrial Education shall provide copies of the Registration for Apprenticeship form to all signatories to the document.

11.0 RATIO OF APPRENTICES TO JOURNEYPERSONS

The ratio of Apprentices to Journeypersons normally shall not exceed one apprentice to every one journeyperson employed. Exceptions for specific occupations may occur with the approval of the Provincial Apprenticeship and Certification Board.

12.0 RELATIONSHIP OF THE PLAN OF TRAINING TO A COLLECTIVE BARGAINING AGREEMENT

Collective agreements take precedence over the conditions outlined in the plan of training.

13.0 AMENDMENTS TO A PLAN OF APPRENTICESHIP TRAINING

A plan of training may be amended at any time by the Provincial Apprenticeship and Certification Board.

14.0 EMPLOYMENT, RE-EMPLOYMENT AND TRAINING REQUIREMENTS

- 14.1 The plan of training requires Apprentices to attend regularly their place of employment.
- 14.2 The plan of training requires Apprentices to regularly attend training programs for that occupation as prescribed by The Provincial Apprenticeship and Certification Board.
- 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 M.O.U.'s reinstated by the Provincial Apprenticeship and Certification Board 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 registering as a Trade Qualifier.
- 14.5 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 opportunity to be re-employed before another is hired.

14.6 The employer will permit each apprentice to attend regularly training programs as prescribed by the Provincial Apprenticeship and Certification Board.

14.7 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 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 within 30 days of the decision.

REQUIREMENTS FOR RED SEAL CERTIFICATION

1. Evidence that the required work experiences outlined in this plan of training have been obtained. This evidence must be in a format that clearly outlines 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 program.
3. A combination of training from an approved training program and suitable work experience totalling 7200 hours

OR

A total of 9000 hours of suitable work experience in the occupation accompanied by sign-off of required work competencies.

4. Completion of a National Red Seal examination, to be set at a place and time determined by the Industrial Training Division.
5. Payment of the appropriate examination fee.

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 captures, in a broad sense, these roles and the responsibilities that result from them.

The Apprentice

- ▶ to complete all required technical training courses as approved by the Provincial Apprenticeship and Certification Board.
- ▶ to find appropriate employment.
- ▶ to complete all required work experiences in combination with the required hours.
- ▶ to ensure that the work experiences are well documented.
- ▶ to approach apprenticeship training with an attitude and commitment that fosters the qualities necessary for a successful career as a qualified journeyman.
- ▶ to obtain the required hand tools as specified by the Board for each period of training of the apprenticeship program.

The Employer

- ▶ to provide high quality work experiences in an environment that is conducive to learning.
- ▶ to remunerate apprentices as set out in this Plan of Training or Collective Agreements.
- ▶ to provide feedback to Training Institutions, Industrial Training Division and Apprentices in an effort to establish a process of continuous quality improvement.
- ▶ where appropriate, to release apprentices for the purpose of returning to a training institution to complete the necessary technical courses.
- ▶ to ensure that work experiences of the apprentices are documented.

The Training Institution

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

The Industrial Training Division

- ▶ to establish and maintain program advisory committees under the direction of the Provincial Apprenticeship and Certification Board.
- ▶ to promote apprenticeship training as a viable career option to prospective apprentices and other appropriate persons involved, such as career guidance counsellors, teachers, parents, etc.
- ▶ to establish and maintain a protocol with training institutions, employers and other appropriate stakeholders to ensure the quality of apprenticeship training programs.
- ▶ to ensure that all apprentices are appropriately registered and records are maintained as required.
- ▶ to schedule all necessary technical training periods for apprentices to complete requirements for certification.
- ▶ to administer provincial/interprovincial examinations.

The Provincial Apprenticeship and Certification Board

- ▶ to set policies to ensure that the provisions of the Apprenticeship Training and Certification Act are implemented.
- ▶ to ensure that advisory and examination committees are established and maintained.
- ▶ to accredit institutions to deliver apprenticeship training programs.
- ▶ to designate occupations for apprenticeship training and/or certification.

Program Outcomes

Upon successful completion of the Machinist Program, apprentices will have demonstrated the knowledge and skills required to perform the following tasks:

- Task 1 Demonstrates safe working practices.
- Task 2 Reads and interprets engineering drawings.
- Task 3 Selects workpiece materials.
- Task 4 Performs layout operations.
- Task 5 Measures workpiece.
- Task 6 Applies basic heat treatment.
- Task 7 Applies basic material testing.
- Task 8 Selects cutting fluids, compounds, coolants and lubricants.
- Task 9 Plans sequences of operations.
- Task 10 Selects cutting tools.
- Task 11 Sets up drills.
- Task 12 Operates drills.
- Task 13 Maintains drills.
- Task 14 Sets up lathes.
- Task 15 Operates lathes.
- Task 16 Maintains lathes.
- Task 17 Sets up milling machines.
- Task 18 Operates milling machines.
- Task 19 Maintains milling machines.
- Task 20 Sets up power saws.

- Task 21 Operates power saws.
- Task 22 Maintains power saws.
- Task 23 Sets up grinders.
- Task 24 Operates grinders.
- Task 25 Troubleshoots grinding operations.
- Task 26 Sets up CNC machines.
- Task 27 Operates CNC machines.
- Task 28 Prepares manual part program.
- Task 29 Prepares NC/CNC parts program using Computer Assisted Design (CAD) and Computer Assisted Manufacturing (CAM) systems.
- Task 30 Sets up horizontal boring mills.
- Task 31 Operates horizontal boring mills.
- Task 32 Troubleshoots boring operations.
- Task 33 Sets up slotters.
- Task 34 Operates slotters.
- Task 35 Sets up shapers.
- Task 36 Operates shapers.
- Task 37 Sets up Electrical Discharge Machines (EDM).
- Task 38 Operates Electrical Discharge Machines (EDM).
- Task 39 Selects and uses hand and power tools.
- Task 40 Disassembles mechanical components.
- Task 41 Assembles mechanical components.

PROGRAM CONTENT

NL Course No.	Atlantic Course No.	Course Name	Hours	Pre-Requisite	Page No.
TS-1510		Occupational Health & Safety	6		17
TS-1520		WHMIS	6		20
TS-1530		First Aid	14		23
MW-1750	MCH-0100	Hand Tools and Basic Layout	90		24
MW-1760	MCH-0106	Machine Shop Measuring 1 (Basic Measurement)	30		29
MW-1770	MCH-0111	Mechanical Drawings 1 (Basic)	30		31
MW-1780	MCH-0115	Cutting Fluids and Coolants	30	TS-1520	33
MW-1790	MCH-0121	Material Selection	8		35
MW-1800	MCH-1107	Machine Shop Measuring 2 (Gauge Blocks and Angular Measurement)	30	MW-1760	36
MW-1810	MCH-1112	Mechanical Drawings 2 (Intermediate)	30	MW-1770	38
MW-1820	MCH-1120	Power Tools / Grinding	45	MW-1750	40
MW-1830	MCH-1122	Heat Treatment	30	MW-1790	44
MW-1840	MCH-0126	Rigging	30		46
MW-1850	MCH-1125	Drilling Machines	45	MW-1750; MW-1760; MW-1800; MW-1780	48
MW-1860	MCH-1130	Lathes and Lathe Accessories	45	MW-1850	53
MW-1870	MCH-1135	Lathe Operations	60	MW-1860	57
MW-1880	MCH-1140	Lathe Drilling, Boring, Reaming and Tapping	30	MW-1870	60
MW-1890	MCH-1145	Planning and Measuring / Precision Layout	45	MW-1810	62
MW-1900	MCH-1150	Taper Turning	30	MW-1880	64
MW-1910	MCH-1155	Basic Threading	45	MW-1900	66
MW-1920	MCH-1160	Horizontal / Vertical Milling Machines	60	MW-1870	69
MW-1930	MCH-1165	Horizontal Milling Machine Operation	45	MW-1920	73
MW-1940	MCH-1170	Advanced Lathe Operation	105	MW-1910	75
MW-1950	MCH-1175	Reciprocating Machines	30	MW-1880	78
MW-1960	MCH-1180	Carbide Tooling	15	MW-1910	80

Machinist

NL Course No.	Atlantic Course No.	Course Name	Hours	Pre-Requisite	Page No.
MW-1970	MCH-1185	Specialty Machinable Materials	6	MW-1790	82
MW-1980	MCH-1190	Spur Gears	45	MW-1920	84
MW-1990	MCH-1195	Testing and Inspecting	15	MW-1810	87
MW-2000	MCH-1200	Vertical Milling Machine Operation	85	MW-1920	88
MW-2010	MCH-1205	Boring Mills	5	MW-2000	90
MW-2020	MCH-1210	Abrasives	15	MW-1820	91
MW-2030	MCH-1215	Cylindrical Grinders	30	MW-1940	93
MW-2040	MCH-1220	Universal Cutter and Tool Grinder	30	MW-2030	94
MW-2050	MCH-1230	Electrical Discharge Machines	5	MW-2060	95
MW-2060	MCH-1235	NC/CNC of Machine Tools	15	MW-1920	96
MW-2070	MCH-1240	CNC Programming	45	MW-2060	98
MW-2080	MCH-1245	Mechanical Fasteners	15	MW-1750	99
MW-2090	MCH-1255	Bevel, Helical and Worm Gears	95	MW-1980	101
MW-2100	MCH-1260	Surface Grinders	30	MW-1930	103
MW-2110	MCH-1265	Electrical ARC Welding	45	MW-1750; MW-1790	105
MW-2120	MCH-1270	Oxy-Fuel Cutting and Welding	45	MW-1750	107
MW-2130	MCH-1275	Electro-Chemical Machining and Electrolytic Grinding	5	MW-2060	109
MW-2140	MCH-XXX	Advance CNC Operation (NL Only)	90	MW-2070	111
*MA-1060		Math	60		113
CM-2150		Workplace Communications	45		116
MR-1220		Customer Service	30		118
SP-2330		Quality Assurance/Quality Control	30		120
MC-1050		Introduction to Computers	30		122
SD-1700		Workplace Skills	30		126
SD-1710		Job Search Techniques	15		128
SD-1720		Entrepreneurial Awareness	15		130
Total Hours			1810		

PROGRAM STRUCTURE

Entry Level Courses					
NL Course No.	Atlantic Course No.	Course Name	Hours	Pre-Requisite	Page No.
TS-1510		Occupational Health & Safety	6		17
TS-1520		WHMIS	6		20
TS-1530		First Aid	14		23
MW-1750	MCH-0100	Hand Tools and Basic Layout	90		24
MW-1760	MCH-0106	Machine Shop Measuring 1 (Basic Measurement)	30		29
MW-1770	MCH-0111	Mechanical Drawings 1 (Basic)	30		31
MW-1780	MCH-0115	Cutting Fluids and Coolants	30	TS-1520	33
MW-1790	MCH-0121	Material Selection	8		35
MW-1800	MCH-1107	Machine Shop Measuring 2 (Gauge Blocks and Angular Measurement)	30	MW-1760	36
MW-1820	MCH-1120	Power Tools / Grinding	45	MW-1750	40
MW-1830	MCH-1122	Heat Treatment	30	MW-1790	44
MW-1840	MCH-0126	Rigging	30		46
MW-1850	MCH-1125	Drilling Machines	45	MW-1750; MW-1760; MW-1800; MW-1780	48
MW-1860	MCH-1130	Lathes and Lathe Accessories	45	MW-1850	53
MW-1870	MCH-1135	Lathe Operations	60	MW-1860	57
MW-1880	MCH-1140	Lathe Drilling, Boring, Reaming and Tapping	30	MW-1870	60
MW-1900	MCH-1150	Taper Turning	30	MW-1880	64
MW-1910	MCH-1155	Basic Threading	45	MW-1900	66
MW-1920	MCH-1160	Horizontal / Vertical Milling Machines	60	MW-1870	69
MW-1950	MCH-1175	Reciprocating Machines	30	MW-1880	78
MW-1960	MCH-1180	Carbide Tooling	15	MW-1910	80
MW-1970	MCH-1185	Specialty Machinable Materials	6	MW-1790	82
MW-2060	MCH-1235	NC/CNC of Machine Tools	15	MW-1920	96
MW-2070	MCH-1240	CNC Programming	45	MW-2060	98
MW-2080	MCH-1245	Mechanical Fasteners	15	MW-1750	99
MW-2120	MCH-1270	Oxy-Fuel Cutting and Welding	45	MW-1750	107

Entry Level Courses					
NL Course No.	Atlantic Course No.	Course Name	Hours	Pre-Requisite	Page No.
*MA-1060		Math	60		113
CM-2150		Workplace Communications	45		116
MR-1220		Customer Service	30		118
SP-2330		Quality Assurance/Quality Control	30		120
MC-1050		Introduction to Computers	30		122
SD-1700		Workplace Skills	30		126
SD-1710		Job Search Techniques	15		128
SD-1720		Entrepreneurial Awareness	15		130
Total Hours			1090		

REQUIRED WORK EXPERIENCE

Block #2					
NL Course No.	Atlantic Course No.	Course Name	Hours	Pre-Requisite	Page No.
MW-1810	MCH-1112	Mechanical Drawings 2 (Intermediate)	30	MW-1770	38
MW-1890	MCH-1145	Planning and Measuring / Precision Layout	45	MW-1810	62
MW-1930	MCH-1165	Horizontal Milling Machine Operation	45	MW-1920	73
MW-1940	MCH-1170	Advanced Lathe Operation	105	MW-1910	75
MW-1990	MCH-1195	Testing and Inspecting	15	MW-1810	87
Total Hours			240		

REQUIRED WORK EXPERIENCE

Block #3					
NL Course No.	Atlantic Course No.	Course Name	Hours	Pre-Requisite	Page No.
MW-1980	MCH-1190	Spur Gears	45	MW-1920	84
MW-2000	MCH-1200	Vertical Milling Machine Operation	85	MW-1920	88
MW-2010	MCH-1205	Boring Mills	5	MW-2000	90
MW-2020	MCH-1210	Abrasives	15	MW-1820	91
MW-2030	MCH-1215	Cylindrical Grinders	30	MW-1940	93
MW-2040	MCH-1220	Universal Cutter and Tool Grinder	30	MW-2030	94
MW-2100	MCH-1260	Surface Grinders	30	MW-1930	103
Total Hours			240		

REQUIRED WORK EXPERIENCE

Block #4					
NL Course No.	Atlantic Course No.	Course Name	Hours	Pre-Requisite	Page No.
MW-2050	MCH-1230	Electrical Discharge Machines	5	MW-2060	95
MW-2090	MCH-1255	Bevel, Helical and Worm Gears	95	MW-1980	101
MW-2110	MCH-1265	Electrical ARC Welding	45	MW-1750; MW-1790	105
MW-2130	MCH-1275	Electro-Chemical Machining and Electrolytic Grinding	5	MW-2060	109
MW-2140	MCH-XXX	Advance CNC Operation (NL Only)	90	MW-2070	111
Total Hours			235		

* **A student who can meet the Mathematics requirement through an ACUPLACER online test may be exempted from Mathematics 1060.**

TS-1510 OCCUPATIONAL HEALTH AND SAFETY

Description:

This course is designed to give participants the knowledge and skills necessary to interpret the Occupational Health and Safety Act, laws and regulations; understand the designated responsibilities within the laws and regulations; the right to refuse dangerous work; and the importance of reporting accidents.

Course Outcomes:

Upon successful completion of this unit, the apprentice will be able to:

- prevent accidents and illnesses
- improve health and safety conditions in the workplace

Theory:

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 & 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 Industrial 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:

Practical skills enhance the apprentices' ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

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.

TS-1520 WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS)

Description:

This course is designed to give participants the knowledge and skills necessary to define WHMIS, examine hazard identification and ingredient disclosure, explain labeling and other forms of warning, and introduce material safety data sheets (MSDS).

Course Outcomes:

Upon successful completion of this course, the apprentice will be able to:

- interpret and apply the Workplace Hazardous Materials Information System (WHMIS) Regulation under the Occupational Health & Safety Act.

Required Knowledge and Skills:

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:

Practical skills enhance the apprentices' ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

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.

SUGGESTED RESOURCES:

1. WHMIS Regulation
2. Sample MSDS sheets

TS-1530

FIRST AID

Description:

This course is designed to give the apprentice the ability to recognize situations requiring emergency action and to make appropriate decisions concerning first aid.

Complete a **St. John Ambulance** Standard First Aid Certificate course.

MW-1750

HAND TOOLS AND BASIC LAYOUT

Outcomes:

Upon successful completion of this unit, the apprentice will be able to:

- select, operate and maintain hand and power tools, equipment and facilities
- demonstrate knowledge of the responsibilities of the machinist for the care and use of tools

Objectives and Content:

ORIENTATION TO SHOP SAFETY

1. Explain Fire regulations
 - i) the schools alarm and evacuation procedures
 - ii) fire exits
 - iii) extinguishers
2. Identify Personal Protective Equipment required for the Machinist trade
 - i) vision
 - ii) hearing
 - iii) clothing
 - iv) footwear
 - v) respiratory
3. Explain the importance of conducting safety inspections of shops

NON-CUTTING HAND TOOLS

4. Identify vises and describe their applications and procedures for use.
 - i) parts
 - ii) sizing methods
 - iii) mounting procedures
 - iv) work holding methods
 - v) special vises
 - vi) care and storage
5. Identify hammers and describe their applications and procedures for use.
 - i) types
 - ii) parts
 - iii) sizing
 - iv) safety precautions
 - v) care and storage

6. Identify screwdrivers and describe their applications and procedures for use.
 - i) types
 - ii) parts
 - iii) safety precautions
 - iv) care and storage

7. Identify wrenches and describe their applications and procedures for use.
 - i) types
 - ii) metric and imperial sizing systems
 - iii) safety precautions
 - iv) care and storage

8. Identify pliers and describe their applications and procedures for use.
 - i) types
 - ii) parts
 - iii) safety precautions
 - iv) care and storage

9. Identify punches and describe their applications and procedures for use.
 - i) types
 - ii) parts
 - iii) safety procedures
 - iv) dressing procedures

10. Identify metal stamps and describe their applications and procedures for use.
 - i) types
 - ii) parts
 - iii) safety precautions
 - iv) care and storage

11. Identify hacksaws and describe their applications and procedures for use.
 - i) types
 - ii) parts
 - iii) safety precautions
 - iv) care and storage files

12. Identify hacksaw blades and describe their applications and procedures for use.
 - i) types
 - ii) factors affecting blade selection

13. Identify files and describe their applications and procedures for use.
 - i) types
 - ii) parts
 - iii) size, make and shape
 - iv) coarseness classifications

- v) cut classification
 - vi) machinist files
 - vii) care and maintenance
 - viii) safety precautions
14. Describe the different filing methods and their applications.
15. Identify scrapers and describe their applications and procedures for use.
- i) types
 - ii) care and storage
16. Identify types of deburring tools and describe their applications and procedures for use.
- i) types
 - ii) care and storage

TAPS AND DIES

17. Describe chisels, their applications and procedures for use.
- i) types
 - ii) parts
 - iii) sizing
 - iv) sharpening and dressing
 - v) precautions during use
18. Describe the different thread types and number taps and their applications.
19. Describe tap failures and remedies.
20. Describe the procedures for using tap extractors.
21. Describe the function of lubricants and the importance of selecting the lubricant.
22. Describe the different types of imperial and metric dies, their applications and use.
23. Describe the procedures used for the installation and use of tap drills.
- i) dies
 - ii) extractors
 - iii) helicoils
24. Describe the consequences of thread failure.
25. Describe the importance of thread fit.
26. Describe thread gauges, their applications and procedures for use.

27. Describe the procedures used to cut threads with taps and dies.

28. Describe the procedures used to calculate tap drill sizes.

HAND REAMERS AND HAND BROACHING

29. Identify broaches and describe their characteristics and applications.

30. Identify reamers and describe their characteristics and applications.

- i) maintenance
- ii) storage

31. Describe the procedures used to perform hand reaming.

32. Describe the procedures used to perform hand broaching.

33. Describe the procedures used for safe operation of an arbor press.

BASIC LAYOUT

34. Identify types of layout tools and describe their applications and procedures for use.

- i) layout tables
- ii) surface plates
- iii) scribes
- iv) dividers
- v) trammels
- vi) hermaphrodite calipers
- vii) squares (adjustable, solid, master)
- viii) combination set
- ix) surface gauge
- x) steel rules
- xi) calipers (spring tempered, flexible, narrow, hook, inside and outside)

35. Identify accessories for layout work and describe their applications and procedures for use.

- i) angle plate
- ii) tool makers clamp
- iii) parallels
- iv) v-blocks
- v) keyseat rules

36. Describe datum or reference surfaces, their purpose and applications.

37. Describe the procedures used to perform accurate layout of work on a flat surface.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Identify hand tools.
2. Draw file a flat surface.
3. Cut tubing and solid stock using a hacksaw.
4. Sharpen a chisel.
5. Thread studs using dies.
6. Select and apply layout coatings
7. Layout work from blueprints
8. Perform basic layout procedure to an accuracy of 1/64 inch.
9. Restore internal threads with a tap.

MW-1760

**MACHINE SHOP MEASURING I
(BASIC MEASUREMENT)**

Outcomes:

Upon successful completion of this unit, the apprentice will be able to:

- read and interpret engineering drawings
- produce freehand sketches
- perform accurate transfer of sizes

Objectives and Content:

APPLIED MATHEMATICS

1. Perform accurate mathematical calculations using fractions.
2. Perform calculations and conversions using the metric and imperial systems.
3. Read measurements using metric and imperial systems.
4. Perform calculations for angular measurement.

BASIC MEASUREMENT

5. Describe the imperial and metric measuring systems and their use in the machinist trade.
6. Identify simple measuring tools and instruments and describe their parts, applications and procedures for use.
 - i) radius gauges
 - ii) combination sets
 - iii) plug gauges
 - iv) tool makers' buttons
 - v) telescopic gauges
 - vi) feeler gauges
 - vii) go-no go gauges
 - viii) wigglers
 - ix) angle gauges
 - x) small hole gauges
 - xi) solid square
 - xii) thread gauges
 - xiii) spring and firm-joint calipers
 - xiv) depth and height gauges
 - xv) steel rules
 - xvi) machinist levels

- xvii) master height gauge
 - xviii) dial indicators
7. Identify types of squares and describe their applications and procedures for use.
 8. Identify surface plates and granite tables and describe the procedures for their use and care.
 9. Identify types of micrometer and describe their characteristics, applications, and procedures for use.
 - i) adjustment
 - ii) care and maintenance
 10. Describe the procedures used to calibrate precision measuring tools.
 11. Describe the cleaning, maintenance and storage of measuring tools and instruments.
 12. Describe the procedures used for transfer of sizes.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

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).

MW-1770 MECHANICAL DRAWINGS 1 (BASIC)

Outcomes:

Upon successful completion of this unit, the apprentice will be able to:

- read and interpret basic engineering drawings.
- produce basic freehand sketches.
- perform accurate transfer of sizes.

Objectives and Content:

BASIC MECHANICAL DRAWINGS

1. Explain the need and procedures for proper care and handling of drawings.
 - i) plastic
 - ii) tape edges
 - iii) notes/changes
 - iv) filing/rolling
 - v) storage
2. Explain the terms “scale” and “dimension”, their use and location on drawings.
3. Explain the terms used in engineering drawings.
 - i) nominal size
 - ii) limits
 - iii) tolerance
 - iv) allowance
 - v) symmetry
4. Identify and interpret the markings used on engineering drawings.
 - i) lines
 - ii) projections
 - iii) dimensions
 - iv) views
 - v) notes
 - vi) finish symbols
 - vii) lay symbols
5. Describe the procedures used to perform accurate reading and transfer of sizes.
6. Describe the procedures used to transfer information to the work piece.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Demonstrate accurate reading and transfer of sizes.
2. Demonstrate the ability to read and interpret basic drawings and transfer information to the workpiece.
3. Prepare and dimension basic freehand sketches of mechanical components and assemblies.
4. Determine dimensions.
5. Identify tolerances and finishes.

MW-1780 CUTTING FLUIDS AND COOLANTS

Outcomes:

Upon successful completion of this unit, the apprentice will be able to:

- select and apply lubricants for machining operations.
- select and use coolants and cutting fluids.
- select and use solvents.

Objectives and Content:

LUBRICANTS

1. Describe the types of friction and their implications.
 - i) sliding friction
 - ii) rolling friction
 - iii) fluid friction
2. Describe the principles, purposes and importance of lubricants.
3. Describe handling, storage and disposal of lubricants.
4. Describe the types of lubricants and their associated methods of application.
 - i) hand oiler
 - ii) wick feed
 - iii) drip feed
 - iv) slinger
 - v) splash
 - vi) pressure system
 - vii) oil mist
 - viii) grease nipples and cups
5. Identify and interpret manufacturers' scheduling for selection of lubricants and lubrication times.

CUTTING FLUIDS AND COOLANTS

6. Identify coolants and describe their purpose and applications.
7. Describe the procedures for mixing and adjusting coolants.
 - i) ratios
 - ii) metric to imperial conversion

8. Describe the procedures used to apply coolants effectively for machining operations.
9. Identify cutting fluids and describe their purpose, characteristics and applications.
10. Describe the methods of applying cutting fluids for machining operations.
 - i) lathe work
 - ii) drilling and reaming
 - iii) milling
 - iv) surface, cylindrical and internal grinding
11. Describe the possible hazards and safe handling practices associated with the use of cutting fluids and coolants.

SOLVENTS

12. Describe solvents, their characteristics and applications.
13. Describe procedures for safe use of solvents.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Select and apply lubricants for machining operations.
2. Clean and lubricate instruments and machinery.
3. Identify, select and mix cutting fluids.
4. Identify, select, use and dispose of cleaning solvents

MW-1790

MATERIAL SELECTION

Outcomes:

Upon successful completion of this unit, the apprentice will be able to:

- select work piece materials.
- demonstrate knowledge of metal properties.

Objectives and Content:

APPLIED MATHEMATICS

1. Read and interpret graphs.

PROPERTIES OF MACHINABLE MATERIALS

2. Describe the properties of metal and their characteristics.
 - i) chemical properties
 - ii) physical properties
 - iii) mechanical properties
3. Describe ferrous and non-ferrous materials and alloys and their applications.
4. Describe non-metallic materials used for machining.
5. Describe the procedures used to determine the carbon content of metal.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Perform file and spark test.
2. Identify a variety of machinable materials.

MW-1800 MACHINE SHOP MEASURING 2 (GAUGE BLOCKS AND ANGULAR MEASUREMENT)

Outcomes:

Upon successful completion of the unit, the apprentice will be able to:

- select, use, maintain and store gauge blocks.

Objectives and Content:

APPLIED MATHEMATICS

1. Perform calculations for angular measurements using sine, cosine and tangents.

GAUGE BLOCKS

2. Identify types of gauge blocks and describe their characteristics and applications.
 - i) purpose
 - ii) grades
 - iii) tolerance
 - iv) accuracy
 - v) materials
 - vi) set sizes and number of blocks
3. Describe procedures used to maintain, store and wring a gauge block.
4. Describe the purpose and applications of wear blocks.
5. Describe the types of gauge block sets.
6. Describe the factors that can affect gauge blocks and their impact.
 - i) temperature
 - ii) contaminants
 - iii) maintenance
 - iv) applications
 - v) calculations
7. Identify toolmakers buttons and describe their applications and procedures for use.
8. Identify sine bars and describe their applications and procedures for use.
9. Identify height build-ups and describe their applications and procedures for use.
 - i) calculations

ANGULAR MEASUREMENT

10. Describe the principles of angular measurement.
 - i) angle gauge blocks

11. Identify the universal bevel protractor and describe its applications and procedures for use.
 - i) parts
 - ii) divisions
 - iii) reading

12. Identify the sine bar and describe its parts, applications and procedures for use.

13. Identify the compound sine plate and describe its parts, applications and procedures for use.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Perform calculation of gauge block buildup using the appropriate formula.
2. Perform gauge block build ups to check the accuracy of an angle using a dial indicator.
3. Demonstrate how to read a vernier protractor.
4. Perform calculations to achieve required angles using gauge blocks and a sine bar.
5. Perform measurement using angle gauge blocks.
6. Perform angular measurement.

MW-1810 MECHANICAL DRAWINGS 2 (INTERMEDIATE)

Outcomes:

Upon successful completion of this unit, the apprentice will be able to:

- read and interpret intermediate engineering drawings.
- produce intermediate freehand sketches.
- perform accurate transfer of sizes using intermediate engineering drawings.

Objectives and Content:

INTERMEDIATE MECHANICAL DRAWINGS

1. Describe the methods of dimensioning and their applications.
2. Describe views, their purpose and use.
 - i) isometric
 - ii) orthographic
 - iii) sectional
3. Identify and interpret industrial drawing symbols and markings.
 - i) surface textures
 - ii) violations of true projections
 - iii) auxiliary views
 - iv) phantom lines
 - v) positional dimension
 - vi) geometric tolerances
 - vii) moldings and castings
4. Identify types of sectional views and describe their characteristics and applications.
5. Describe procedures used for geometric tolerancing.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Demonstrate the ability to read and interpret intermediate drawings and transfer information to the workpiece.
2. Prepare intermediate freehand sketches of mechanical components and assemblies.

3. Determine dimensions.
4. Identify tolerances and finish symbols.

MW-1820

POWER TOOLS / GRINDING

Outcomes:

Upon successful completion of this unit, the apprentice will be able to:

- select, use and care for pneumatic and hydraulic tools.
- set up, operate and maintain power saws.
- set up, operate and maintain hand grinding machines.

Objectives and Content:

POWER TOOLS

1. Identify types of saws and attachments and describe their characteristics and applications.
 - i) hacksaw
 - ii) vertical and horizontal band saws
 - iii) abrasive and cut-off saw
 - iv) cold cut saw
 - v) rip fence
 - vi) protective devices
 - vii) blade changes
 - viii) abrasive wheels
 - ix) saw guide selection
 - x) power feed
 - xi) work holding jaws
2. Describe sawing operations, their associated equipment.
 - i) friction sawing
 - ii) stock cutting
 - iii) internal and external contour sawing
 - iv) notching and slotting
 - v) radius cutting and splitting
 - vi) angular cutting
 - vii) disc cutting
 - viii) cut-off and mitering
3. Describe blade types and their characteristics.
 - i) composition
 - ii) sizing
 - iii) teeth
 - iv) pitch
 - v) set

4. Describe potential problems during sawing operations, their causes and remedies.
5. Describe preventive maintenance procedures for sawing equipment.
 - i) care
 - ii) storage
 - iii) blade welding
6. Describe the procedures used to perform speed and feed calculations.
 - i) factors
 - ii) formulae
 - iii) tables and charts
7. Identify a portable keyseater and describe its applications and procedures for use.
8. Describe the procedures and safety precautions used to operate a hydraulic press.
9. Describe the application and procedure for use of a portable keyseater.
10. Identify types of power tools and describe their characteristics, applications and procedures for use.
 - i) pneumatic
 - ii) hydraulic
 - iii) electric
11. Describe the procedure and safety precaution used for the operation of hydraulic press.

GRINDING

12. Identify grinders and describe their parts, characteristics and applications.
 - i) bench and floor grinders
 - ii) side wheel grinders
 - iii) die grinders
 - iv) disk grinders
13. Describe grinding wheels, their characteristics and applications.
 - i) wire wheels and buffers
 - ii) grinding disks
 - iii) sanding disks
 - iv) flap wheels

14. 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
15. Describe types of hand dressers, their characteristics applications and procedures for use
 - i) abrasive stick
 - ii) mechanical dressers (strawwheel)
16. Describe the procedures used to test and mount a grinding wheel.
17. Describe the procedures used to dress a grinding wheel by hand.
18. Describe the procedures used to perform hand grinding operations.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Identify various types of:
 - i) grinding wheel
 - ii) saw blades
 - iii) grinding wheel dressers
2. Cut work accurately with a vertical bandsaw.
3. Select, install and use blades.
4. Perform hand grinding operations using steel stock.
5. Test and replace the grinding wheel.
6. Adjust work rests and guards.
7. Ring test, mount grinding wheel, set guards and dress wheel.
8. Weld band saw blade to calculated length.
9. Identify a variety of portable power tools.

10. Set up and operate keyseater to make a keyseat in a given shaft.

MW-1830

HEAT TREATMENT

Outcomes:

Upon successful completion of this unit, the apprentice will be able to:

- demonstrate knowledge of basic heat treatment processes and their associated procedures.

Objectives and Content:

APPLIED MATHEMATICS

1. Perform temperature conversions
2. Perform Area Calculations

HEAT TREATMENT OF CARBON STEELS

3. Determine the carbon content and mechanical properties of steels.
4. Describe the various processes used in the treatment of steels.
 - i) quenching
 - ii) cooling
 - iii) tempering
 - iv) annealing
 - v) spheroidizing
 - vi) hardening
 - vii) normalizing
 - viii) stress relieving
 - ix) forging
5. Interpret charts and tables used in the heat treatment of steel.
6. Describe the factors affecting the selection of tool steels.
7. Describe the processes used for hardening steel and the properties of the steel produced by each.
 - i) water hardening
 - ii) oil hardening
 - iii) air hardening
8. Describe the procedures and equipment used for application of basic heat treatment.

MATERIAL TESTING

9. Describe the purpose and applications of materials testing.
 - i) hardness
 - ii) composition
 - iii) properties

10. Describe types of material testing.
 - i) destructive
 - ii) non-destructive

11. Identify the machines used in hardness testing and describe their principles and operating procedures.
 - i) Rockwell Hardness Tester
 - ii) Brinell Hardness Tester
 - iii) Scleroscope

12. Describe the procedures used to test steels.
 - i) tensile strength test
 - ii) impact test
 - iii) spark test
 - iv) file test

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Perform file and spark test.
2. Heat treat a workpiece.
3. Perform the procedure for testing metals.

MW-1840

RIGGING

Outcomes:

Upon successful completion of this unit, the apprentice will be able to:

- demonstrate knowledge of slings, cables and cranes.
- select and use rigging equipment.
- use rigging charts and manuals, rules of thumb

Objectives and Content:

1. Identify relevant Occupational Health and Safety regulations.
 - i) rigging
 - ii) safety belts
 - iii) lifelines
2. Describe responsibilities and liabilities in the use of rigging, lifting and hoisting equipment.
3. Identify types of ropes and describe their characteristics and applications and procedures for use.
4. Describe types of knots, hitches and bends and their applications.
5. Explain angle considerations when using rigging.
 - v) rigging charts
 - vi) rule of thumb formula
 - vii) compensation for angles in lifting of loads
6. Describe types of wire rope and accessories, their care, inspection and safety.
 - viii) considerations for use
 - ix) construction
 - x) clips and attachments
 - xi) slings and end rigging
 - xii) measurement
 - xiii) clamps and rigging
 - xiv) splicing
 - xv) shackles
 - xvi) spreader beams

7. Describe slings, their characteristics applications and limitations.
 - i) chain
 - ii) synthetic
 - polyethylene
 - polyester
 - nylon
8. Describe the procedures and equipment used for handling objects with rigging equipment.
9. Describe jacks, their applications and procedures for use.
10. Identify and interpret hand signals.
11. Describe types of overhead crane and procedures for their use.
 - i) mobile
 - ii) boom

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Select equipment and perform rigging procedures for safe lifting of loads.
2. Perform hand signals.
3. Tie Knots, hitches and bends.

MW-1850

DRILLING MACHINES

Outcomes:

Upon successful completion of this unit, the apprentice will be able to:

- demonstrate knowledge of the operating principles, parts and applications of various types of drilling machines.
- set up, operate and maintain drilling machines.

Objectives and Content:

DRILLING MACHINES AND ACCESSORIES

1. Describe a drill press, its parts and applications.
 - i) base
 - ii) column
 - iii) table
 - iv) drilling head
2. Identify upright drilling machines and describe their characteristics, applications, and procedures for use.
 - i) parts
 - gear box
 - spindle advance
 - table
 - ii) operating principles
 - iii) capabilities
3. Describe the application and procedures for use of a magnetic drilling machine and its accessories.
4. Describe the specific safety precaution when working with a magnetic drilling machine.
5. Identify radial arm drilling machines and describe their characteristics, applications, and procedures for use.
 - i) parts
 - base
 - column
 - radial arm
 - drilling head
 - ii) operating principles
 - iii) capabilities

6. Identify work holding devices and describe their applications and procedures for use.
 - i) drill vise
 - ii) drill drifts
 - iii) angle vise
 - iv) v-block
 - v) step blocks
 - vi) angle plate
 - vii) drill jigs
 - viii) clamps
 - ix) jacks
 - x) spacer blocks
 - xi) parallels

7. Identify tool holding devices and describe their applications.
 - i) drill chucks (tapered and threaded)
 - ii) key type
 - iii) keyless
 - iv) precision keyless
 - v) drill sleeves
 - vi) drill socket
 - vii) quick change
 - viii) power tapping attachment
 - ix) drill drifts

8. Describe the various materials used to manufacture drills.

9. 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

10. Describe the preventive maintenance, care and storage of drilling equipment and accessories.

11. Identify magnetic drilling machines and describe their applications and procedures for use.
 - i) operating principles
 - ii) capabilities
 - iii) accessories
 - iv) safety precautions

TWIST DRILLS

12. Identify twist drills and describe their characteristics and applications.
 - i) materials
 - ii) sizing
 - iii) components
 - shank (tapered and straight)
 - body (flutes, margin, body clearance, web)
 - point (chisel edge, lips, lip clearance, heel, angles, variation, clearances)

13. Describe types of drills and their applications.
 - i) high helix
 - ii) core drills
 - iii) oil hole drills
 - iv) straight-fluted drills
 - v) deep hole, gun and ejector drills
 - vi) spade drills
 - vii) hole-saws
 - viii) centre drills
 - ix) jobber drills

14. Describe potential problems during drilling operations, their causes, prevention and remedies.
 - i) discoloration
 - ii) broken or split drill
 - iii) poor tool life
 - iv) holes out of round
 - v) color and chip shape
 - vi) drilling pressures
 - vii) poor hole finish
 - viii) chatter
 - ix) squeaking and jamming

15. Describe the procedures used to sharpen a twist drill.
 - i) using offhand grinders
 - ii) using drill sharpening machine
 - iii) using a bench grinder
 - iv) measuring angles for different materials
 - v) point angle measurement
 - vi) web thinning

SPEED, FEED AND DEPTH OF CUT

16. 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
17. Interpret drill charts and tables.

DRILLING HOLES AND DRILL PRESS OPERATIONS

18. Describe the procedure for tooling and setup for web thinning.
 - i) reasons and methods for correcting
 - ii) drilling
 - iii) counterboring
 - iv) countersinking
 - v) tapping
 - vi) reaming
19. Describe the procedures for performing spot facing, counterboring, countersinking and tapping operations.
20. Describe safety procedures and precautions related to drilling operations.
21. Identify types of reamers and describe their applications.
22. Describe the procedures used for reaming holes.
23. Describe the sequence for drilling operations.
24. Describe potential problems pertaining to drilling operations, their causes and remedies.
25. Perform calculations for tap drill sizing
26. Describe the procedures used to install tapered pins in hub and shaft assembly.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

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 spotfacing, counterboring and countersinking operations.
5. Ream straight holes.
6. Drill work held in a vise.
7. Drill large holes and deep holes.
8. Drill round work held in a v-block.
9. Tap holes by hand, by drill press and tapping attachment.

MW-1860 LATHES AND LATHE ACCESSORIES

Outcomes:

Upon successful completion of this unit, the apprentice will be able to:

- demonstrate knowledge of the operating principles of lathe machines.
- demonstrate knowledge of operator maintenance procedures.
- select cutting tools

Objectives and Content:

CONVENTIONAL LATHES AND LATHE ACCESSORIES

1. 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

2. Describe lathe machines, their parts, sizing, and applications.
 - i) engine lathe
 - ii) single and multi-spindle automatic lathes

3. Describe procedures used for preventative maintenance of lathe machines.
 - i) cleaning
 - ii) lubrication
 - iii) adjustments
 - gibs
 - tailstock
 - drive belts

4. Describe lathe accessories and work holding devices, their purpose and applications.
 - i) lathe centres
 - dead
 - live
 - micro-set
 - adjustable

- ii) chucks
 - three jaw universal
 - four jaw independent
 - spring collett
 - Jacobs collet
 - chuck
 - magnetic chuck
 - iii) lathe dogs
 - standard bent-tail
 - straight tail
 - clamp type)
 - iv) mandrels
 - solid, expansion
 - gang
 - threaded
 - taper shank
 - v) toolposts and tool holders
 - left hand offset
 - right hand offset
 - straight
 - parallel
 - cutting off or parting tools
 - threading
 - light boring
 - knurling tool
 - vi) turret toolposts
 - vii) multi-toolpost
 - viii) face plate
5. 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

6. Describe tooling.
- i) types
 - ii) composition
 - iii) applications

7. Explain tool nomenclature.
 - i) cutting edge
 - ii) face
 - iii) flank nose
 - iv) radius
 - v) point
 - vi) shank

8. Describe angles and clearances.
 - i) cutting tools
 - ii) side cutting edge
 - iii) end cutting edge
 - iv) side relief (clearance angle)
 - v) back rake (top)
 - vi) side rake angle point angle

9. 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

10. Describe the procedures used to install tooling.

11. Describe the procedures used to face internal and external shapes and surfaces.

12. Describe the procedures used to set up and grind a tool bit.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Grind a left hand turning and facing tool.
2. Grind a right hand turning and facing tool.
3. Grind a 60 degree threading tool.
4. Grind a parting off or grooving tool.
5. Identify the parts of a lathe and state their function.

6. Perform adjustments for gibs and backlash in the crossslide and compound rest.

MW-1870

LATHE OPERATIONS

Outcomes:

Upon successful completion of this unit, the apprentice will be able to:

- plan and perform basic lathe operations.
- select tooling for associated applications.
- troubleshoot lathe operations.

Objectives and Content:

PROCEDURES

1. Describe safety procedures and precautions related to lathe operation.
2. Describe safety procedures and precautions related to filing and polishing.
3. Describe sequencing of lathe activities.
4. Describe tooling and accessories for specific operations.
 - i) tool selection
 - ii) set tool height
5. Describe the procedures used for operating, adjusting and maintaining lathe machinery.
6. Describe the procedures used for aligning lathe centres.
7. Describe the procedures used to carry out lathe operations.
 - i) machining diameters to size
 - ii) face to length
 - iii) shoulders
 - iv) parallel turning
 - v) shoulder turning
 - vi) undercutting diameter and shoulders
 - vii) chamfering
 - viii) radius
 - ix) machining between centres
 - x) knurling
 - xi) parting off
 - xii) machining grooves

MACHINING IN A CHUCK

8. Identify types of spindle noses and describe the operating principles.

9. Describe the procedures used to mount and remove chucks.
10. Describe the procedures used to assemble a three-jaw chuck.
11. Describe the procedures used to mount work in a three-jaw chuck.
12. Describe the procedure used to mount work in a four-jaw chuck.
13. Describe the procedures used to set up in a four-jaw chuck using a dial indicator.
14. Describe factors that affect selection of tooling and accessories.
15. Describe the procedures used to cut or part off work in a chuck.
16. Describe the procedures used to set up and operate the lathe.
17. Describe the procedures used to produce rough and finished precision machined work in a chuck.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Mounting and remove chucks.
2. Assemble a three-jaw chuck.
3. Mount work in a three-jaw chuck.
4. Set up in a four-jaw chuck using a dial indicator.
5. Cutt or part off work in a chuck.
6. Perform the procedures for rough and finished turning work in a chuck.
7. Perform the procedures to set up a lathe to machine grooves.
8. Select tooling and accessories.
9. Set up and operate a lathe to:
 - i) machine grooves
 - ii) part or work pieces
 - iii) machine between centres

- iv) knurl
- v) radius
- vi) machine diameters to size
- vii) face to length
- viii) shoulders
- ix) parallel turning
- x) shoulder turning
- xi) undercut diameter and shoulders.

10. Troubleshoot lathe operations

MW-1880 LATHE DRILLING, BORING, REAMING AND TAPPING

Outcomes:

Upon successful completion of this unit, the apprentice will be able to:

- plan drilling, boring, reaming and tapping operations.
- select tooling.
- perform and troubleshoot drilling, boring, reaming and tapping operations.

Objectives and Content:

DRILLING

1. Describe the procedures used for spotting and drilling work in a chuck.
2. Describe the procedures used for reaming work in a lathe.
3. Describe the procedures used when tapping operations on a lathe are required.

BORING

4. Describe counterboring, its purpose, applications and associated procedures.
5. Describe the procedures used to bore work in a chuck.
6. Describe countersinking, its purpose, applications and associated procedures.

REAMING

7. Identify hand reamers and describe their applications and procedures for use.
8. Describe common types and styles of machine reamers, their characteristics and applications.
 - i) rose
 - ii) fluted
 - iii) carbide tipped
 - iv) shell
9. Describe the procedures used to ream work in a lathe.
 - i) reaming allowance
 - ii) speeds
 - iii) feed rates

TAPPING

10. Describe the applications of tapping.
11. Describe types of taps, their characteristics and applications.
12. Describe the procedures used to perform tapping operations.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

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 mandral.

MW-1890 PLANNING AND MEASURING / PRECISION LAYOUT

Outcomes:

Upon successful completion of this unit, the apprentice will be able to:

- read and interpret mechanical drawings.
- plan machining operations.
- measure work pieces accurately using measuring tools and precision instruments.
- lay out work accurately.

Objectives and Content:

JOB PLANNING

1. Read and interpret advanced blueprint specifications.
 - i) tolerance
 - ii) finish requirements
 - iii) geometric tolerancing and dimensioning
2. Describe the operations to be performed in priority sequence.
3. Explain and perform cutting time calculations.
4. Identify machines and tooling required to complete required work.
5. Calculate layout dimensions and reference points.
6. Calculate angles, arcs and location from reference point.
7. Identify and explain fixed and variable costs.

PRECISION LAYOUT

8. Identify precision measuring tools and describe their applications and procedures for use.
 - i) universal bevel protractor
 - ii) sine bar
 - iii) sine plate (bar)
 - iv) precision height gauge
 - v) concentricity test equipment
 - vi) gauge blocks
9. Perform sine bar calculations.

10. Describe the procedures used to perform a precision layout using a sine bar, gauge blocks and a precision height gauge.

INSPECTION AND MEASUREMENT

11. Describe the basic terms of measurement.
 - i) basic dimension
 - ii) limits
 - iii) tolerance (unilateral and bilateral)
 - iv) allowance
 - v) dual dimensioning
12. Describe precision measuring instruments, their characteristics and applications, care and maintenance:
 - i) fixed gauge
 - ii) cylindrical plug gauge
 - iii) ring gauge
 - iv) taper plug gauge
 - v) snap gauge
13. Describe the instruments and procedures used to:
 - i) determine dimensions
 - ii) identify tolerances
 - iii) inspect work piece as per drawing specifications
 - iv) inspect surface finishes and interpret results

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Perform a precision layout from a drawing using a sine bar, gauge blocks and a precision height gauge.
2. Verify layout against drawings.
3. Perform inspection for accuracy of a previously made part.
4. Perform concentricity testing procedures.
5. Perform cutting time calculations.

MW-1900

TAPER TURNING

Outcomes:

Upon successful completion of this unit, the apprentice will be able to:

- calculate tapers.
- select attachments.
- check and measure tapers.

Objectives and Content:

APPLIED MATHEMATICS

1. Calculate tapers in both imperial and metric measurements.
2. Perform angular measurements.
3. Calculate tailstock offset.
4. Calculate taper advancement.

TAPERS AND TAPER TURNING

5. Identify types of tapers and describe their characteristics and applications.
 - i) self-holding tapers
 - ii) steep tapers
 - iii) standard tapers
6. Describe the formula for taper calculations.
 - i) taper per foot
 - ii) taper per inch
 - iii) metric tapers
7. Describe the procedures used for taper turning using the tailstock.
8. Identify types of taper attachments and describe their characteristics, applications and procedures for use.
 - i) telescopic taper attachment
 - ii) compound rest
 - iii) plain
9. Describe the procedures used to measure tapers.
 - i) metric
 - ii) imperial
 - iii) taper micrometer

10. Describe the procedures used to fit an external taper.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Turn various tapers using various methods.
2. Measure taper using available method.

MW-1910

BASIC THREADING

Outcomes:

Upon successful completion of this unit, the apprentice will be able to:

- set up lathes to machine threads.
- measure and gauge threads.
- cut internal and external threads according to classification.

Objectives and Content:

THREAD CHARACTERISTICS

1. Describe threads and their applications.
2. 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
3. Identify thread forms and describe their characteristics.
 - 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
4. 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
5. 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
6. Describe the procedures used to transpose lathe gears for threading.

THREAD CUTTING OPERATIONS

7. Describe the procedures used to sharpen tools and set up a lathe accurately for threading.
8. Identify the thread chasing dial and describe its applications and procedures for use.
9. Describe procedures used to reset a threading tool.
10. Describe the various methods used to measure and gauge threads.
- i) thread ring gauges
 - ii) thread plug gauges
 - iii) snap gauges
 - iv) three wire method
 - v) thread micrometer
 - vi) thread comparator micrometer

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Machine threads:
 - i) national course
 - ii) 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.
5. Repair damaged thread by picking up a thread.

MW-1920 HORIZONTAL / VERTICAL MILLING MACHINES

Outcomes:

Upon successful completion of this unit, the apprentice will be able to:

- demonstrate knowledge of the operating principles and parts of milling machines.
- select tooling and accessories.
- calculate speeds and feeds.
- set up milling machines.
- secure work pieces.

Objectives and Content:

MILLING MACHINES

1. Identify types of milling machines and describe their characteristics.
 - i) knee and column
 - ii) plain horizontal
 - iii) universal horizontal
 - iv) standard vertical
 - v) ram-type vertical
 - vi) manufacturing types
 - vii) numerically controlled machine centres

2. Identify the parts and controls of milling machines and describe their purpose and operation.
 - i) base
 - ii) table
 - iii) housing
 - iv) overarm and arbor supports
 - v) knee
 - vi) column
 - vii) saddle
 - viii) speed and feed controls
 - ix) hand wheels, cranks and graduated collars
 - x) coolant system
 - xi) backlash eliminator
 - xii) table swivel block
 - xiii) feed trip dogs and limit stops
 - xiv) parts and controls specific to vertical mills
 - xv) elevating mechanism
 - xvi) drive
 - xvii) overarm (ram)
 - xviii) draw bolts
 - xix) digital readout

3. Identify milling machine accessories and attachments and describe their applications.
 - 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

4. Describe the different types of materials used in milling cutter construction.
 - i) high speed steel
 - ii) tungsten carbide
 - iii) carbon steel
 - iv) titanium
 - v) cemented carbides
 - vi) ceramic

5. Describe types of cutters and 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

MILLING MACHINE SETUP

6. Describe the factors that determine milling feed, speed and depth of cut calculations and their importance.

7. Describe the procedures used to perform calculations for milling feed and depth of cut for metric and imperial milling operations.

8. Describe the two types of feed directions, their differences and applications.
9. Describe safety practices relating to milling machines.
10. Describe practices that affect accuracy and efficiency.
11. Describe the set up procedures for mounting and removing milling cutters.
12. Describe the procedures for aligning the table on a universal milling machine.
13. Describe the procedures used to align a vise on a milling machine.
14. Identify appropriate cutters, work holding devices and accessories for applications.
15. Describe procedures used to align vertical milling machine head.
16. Describe procedures used to locate an edge.
17. Describe the procedures used to maintain and adjust mills.
18. Describe the procedures used to clean and lubricate milling machines.
19. Describe potential set-up problems, their causes and remedies.
20. Describe the procedures used to set up and cut opposing keyways in a shaft.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Align a vise on a milling machine
 - i) 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. Perform slotting.

6. Perform boring using offset boring head.
7. Centre cutters.

MW-1930 HORIZONTAL MILLING MACHINE OPERATION

Outcomes:

Upon successful completion of this unit, the apprentice will be able to:

- perform milling operations.
- use sawing and slitting cutters.

Objectives and Content:

1. Describe the two basic types of milling machine operations.
 - i) plain milling
 - ii) face milling
2. Describe the procedures used for setting the cutter to the work surface.
3. Describe the procedures used for milling a flat surface.
 - i) rough
 - ii) finish
 - iii) locating an edge
4. Describe the procedures used for machining.
 - i) cavities
 - ii) angles
 - iii) keyways
 - iv) slots
5. Describe the procedures used to perform milling operations.
 - i) conventional
 - ii) flat surface
 - iii) face
 - iv) side
 - v) straddle
 - vi) gang
 - vii) climb
6. Describe the procedures used with sawing and slitting cutters.
7. Describe the causes of milling cutter failure and practices for prevention.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Centre and set the cutter to the work surface.
2. Mill a flat surface.
3. Perform milling operations.
 - i) face
 - ii) side
 - iii) straddle
4. Perform sawing/slitting operations.
5. Align the table on a universal milling machine.

MW-1940

ADVANCED LATHE OPERATION

Outcomes:

Upon successful completion of this unit, the apprentice will be able to:

- demonstrate knowledge of a variety of advanced thread forms.
- cut advanced thread forms
- measure threads
- cut contours and forms

Objectives and Content:

CONTOURS AND FORMS

1. Explain the principles of form turning.
2. Identify the types of form turning tools and describe their characteristics and applications.
3. Describe the procedures used to perform forming operations.
4. Describe the functions, uses and maintenance of faceplates and rests.
5. Describe the setup, work positioning and procedures used to turn eccentrics.
6. Describe the procedures used to mount and adjust rests.
7. Describe the procedures used for toolpost grinding.

THREADS

8. Describe thread forms and classes of fit.
9. Describe the procedures used to perform imperial and metric thread calculations.
10. Describe the procedures used to change an imperial design lathe to metric threading.
11. Describe the procedures for cutting internal and external threads.
12. Describe the procedures used to cut threads on a tapered section.
13. Describe the procedures used to cut left hand thread.
14. Describe the instruments used to measure threads.

15. Describe the procedures used to measure threads.
 - i) three-wire method
 - ii) one-wire method
 - iii) thread micrometer

ADVANCED THREADING AND MULTIPLE STARTS

16. Describe the various forms of screw threads and describe their applications.
 - i) ACME
 - ii) square
 - iii) round (knuckle)
 - iv) buttress
 - v) American National
 - vi) Unified National
 - vii) metric
17. Describe the characteristics, purpose and applications of multiple start threads.
18. Describe the procedures used for the various methods of cutting multiple-start threads.
 - i) slotted drive or faceplate
 - ii) indexing of the spindle gear
 - iii) use of thread chasing dial
 - iv) compound rest method
19. Describe the features of an ACME thread and its applications.
20. Describe the procedures used to cut an ACME thread.
21. Describe the procedures used to measure an ACME thread using the one wire method.
22. Describe the purpose of internal threads.
23. Describe the procedure used to cut a tapered thread.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Set up and machine a simple eccentric.
2. Calculate and measure using the one wire method (ACME)

3. Perform imperial and metric thread calculations.
4. Machine a double start ACME stud.
5. Machine a mating nut with 2A and 2B fit for an ACME thread.
6. Perform calculations, set-up and work positioning to machine eccentrics.
7. Machine a tapered pipe thread.
8. Set up and machine a contour.

MW-1950

RECIPROCATING MACHINES

Outcomes:

Upon successful completion of this unit, the apprentice will be able to:
– set up and operate shapers, slotters and broaching machines.

Objectives and Content:

SHAPERS

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

SLOTTERS

4. Identify slotters and describe their characteristics and applications.
 - i) parts
 - ii) capacity
 - iii) applications
5. Describe the tool holders and cutters used with slotters.
6. Identify work holding devices used with slotters and describe their characteristics and applications.
7. Describe the procedures used for setting up slotters.
 - i) stroke length
 - ii) stroke angle
 - iii) stroke positioning
 - iv) workpiece alignment
8. Describe the procedures used for machining slots.

MACHINE BROACHING

9. Describe the principles of machine broaching and its applications.
10. Identify the types of broaching machines and describe their characteristics and applications.
11. Describe the procedures used for broaching slots.
12. Describe the procedures for cutting keyways.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Perform speed, feed and depth calculations.
2. Set stroke length and ram positioning.
3. Grind a shaper cutting tool.
4. Cut a keyway.

MW-1960

CARBIDE TOOLING

Outcomes:

Upon successful completion of this unit, the apprentice will be able to:

- select and use carbide tooling for a variety of applications.

Objectives and Content:

1. Describe the characteristics and applications of carbides.
2. Identify the types of carbide tools and describe their characteristics and applications.
 - i) brazed tip
 - ii) indexable inserts
3. Describe the grading of carbides and factors affecting it.
4. Explain nomenclature related to carbide tooling.
 - i) front or end relief (clearance)
 - ii) side relief (clearance) side cutting edge angle
 - iii) nose radius
 - iv) side rake
 - v) back rake
 - vi) negative/positive carbide insert geometry
5. Describe the procedures used for machining with carbides.
6. Identify types of cutting tools.
 - i) diamond
 - ii) ceramic
 - iii) cermet
7. Describe the procedures and precautions involved in the use of cutting tools.
 - i) diamond
 - ii) ceramic
 - iii) cermet
8. Identify and interpret the selection charts for carbide tool inserts for tooling problems and probable causes.
 - i) carbide
 - ii) diamond
 - iii) ceramic
 - iv) cermet

9. Describe the factors affecting speed, feed and depth of cut.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Identify and interpret the basic carbide insert identification system chart.
2. Calculate speeds and feeds and depth of cut.
3. Grind carbide tools.
4. Use brazed carbide tools.

MW-1970

SPECIALTY MACHINABLE MATERIALS

Outcomes:

Upon successful completion of this unit, the apprentice will be able to:

- demonstrate knowledge of the characteristics of plastics with reference to machining operations.
- demonstrate knowledge of the characteristics of specialty steels with reference to machining operations.
- machine various plastics and specialty steels.

Objectives and Content:

NON-METALLIC MATERIALS

1. Identify non-metallic materials and describe their characteristics and applications.
2. Describe hazards and safety precautions involved in machining non-metallic materials.
3. Describe the principles and procedures for machining non-metallic materials.
4. Describe the procedures used to mark work pieces for identification.

SPECIALTY STEELS

5. Identify ferrous metals and describe their characteristics and applications.
6. Describe hazards and safety precautions involved in machining special steels.
7. Identify coolants used with specialty steels and describe factors affecting their selection.
8. Identify non-ferrous metals and describe their characteristics and applications.
9. Explain the effects and purposes of alloying metal.
10. Describe the characteristics and applications of:
 - i) white metals
 - ii) refractory metals
 - iii) precious metals

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

MW-1980

SPUR GEARS

Outcomes:

Upon successful completion of this unit, the apprentice will be able to:

- demonstrate knowledge of the different types of gears and their applications
- identify and select gear cutters
- mill gears
- measure gear teeth

Objectives and Content:

INTRODUCTION TO GEARS

1. Describe the principles, purpose and operation of gears.
2. Identify the different types of gears and describe their applications
 - i) spur
 - ii) internal
 - iii) rack
 - iv) helical
 - v) pinion
 - vi) hypoid
 - vii) herringbone
 - viii) bevel
 - ix) miter
 - x) angular bevel
 - xi) worm and worm gears
3. Define gear terminology
 - i) addendum
 - ii) centre distance
 - iii) chordal addendum
 - iv) chordal thickness
 - v) circular thickness
 - vi) clearance
 - vii) circular pitch
 - viii) dedendum
 - ix) diametrical pitch
 - x) involute
 - xi) linear pitch
 - xii) module (metric gears)
 - xiii) outside diameter
 - xiv) pitch circle
 - xv) pitch circumference

- xvi) pitch diameter
- xvii) pressure angle
- xviii) root circle
- xix) root diameter
- xx) tooth thickness
- xxi) whole depth
- xxii) working depth

4. Describe the procedures used for rack milling.

GEAR CUTTING

5. Describe the characteristics of involute gear cutters.
6. Describe how gear cutters are sized.
- i) imperial
 - ii) metric
7. Describe the characteristics of a gear cutter set and the factors relating to the number of gear teeth to be cut.
8. Identify and interpret the chart for involute gear cutters.
- i) metric
 - ii) imperial
9. Describe the procedures used to cut a spur gear.
10. Describe procedures used to cut a rack gear.

GEAR TOOTH MEASUREMENT

11. Describe the methods of gear tooth measurement.
- i) micrometer and wire
 - ii) gear tooth vernier
12. Describe the factors affecting accurate measurement of gear teeth.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined before are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Perform the calculations and procedures for cutting a spur gear.

2. Perform gear tooth measurement.
3. Perform differential indexing.

MW-1990

TESTING AND INSPECTING

Outcomes:

Upon successful completion of this unit, the apprentice will be able to:

- demonstrate knowledge of precision measurement systems, instruments and their associated techniques.

Objectives and Content:

1. Identify mechanical and electronic comparators and describe their characteristics, applications, and procedures for use:
 - i) optical
 - ii) pneumatic
 - iii) dial indicators
2. Describe the purpose, parts and applications of the coordinate measuring system.
3. Identify the rectangular and polar coordinate systems and describe their characteristics and use.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined before are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Perform a quality assurance check on a part using appropriate equipment.

MW-2000 VERTICAL MILLING MACHINE OPERATION

Outcomes:

Upon successful completion of this unit, the apprentice will be able to:

- calculate gear formula
- demonstrate knowledge of the vertical milling machine
- perform a variety of milling operations on a vertical mill

Objectives and Content:

APPLIED MATHEMATICS

1. Apply appropriate formula as required.

VERTICAL MILLING MACHINE

2. Identify vertical milling machines and describe their construction and features.
3. Describe procedures used for tramming the spindle (aligning the head).
4. Describe the procedures used to perform milling operations using rotary tables.
5. Describe the procedures used for machining angles and radii.
6. Describe the procedures used for machining parallel T-shots.
7. Describe the procedures used to machine dovetail slides.
 - i) parts
 - ii) calculations
 - iii) measurements
 - iv) procedures
8. Describe the procedures used for drilling holes.
 - i) 90 degrees to the work piece
 - ii) angular holes
9. Describe the procedures used to ream holes on a vertical mill.
10. Describe the procedures used to bore holes on a vertical mill.
11. Describe the procedures used to tap holes on a vertical mill.

DIVIDING HEAD AND ROTARY TABLE

12. Describe the principles and procedures involved in indexing.
 - i) direct
 - ii) simple
 - iii) angular
 - iv) differential
 - v) linear division
13. Identify types of dividing heads and describe their characteristics and applications.
 - i) standard
 - ii) wide range
14. Identify the rotary table and describe its construction and procedures for use.
15. Identify mill attachments and describe their purpose and applications.
16. Describe the procedures used to carry out milling operations.
 - i) machine slots with a dividing head
 - ii) mill surfaces
 - iii) shapes
 - iv) mill using indexing heads
 - v) machine angles and radii

ADVANCED MILLING OPERATIONS

17. Describe the various types of cams, cam motions and their applications.
18. Describe the procedures used for cam milling.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined before are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Perform the calculations required to mill a cam.
2. Layout a bolt hole pattern on a rotary table.
3. Machine an internal and external dovetail.

MW-2010

BORING MILLS

Outcomes:

Upon successful completion of this unit, the apprentice will be able to:

- set up and operate boring mills.

Objectives and Content:

BORING MILLS

1. Identify boring mills and describe their components and applications.
 - i) horizontal
 - ii) vertical
2. Identify types of tooling and accessories for boring mills and describe their applications.
3. Describe the procedures for the set-up of horizontal and vertical boring mills.
4. Describe the procedures used to calculate for speeds and feeds.
5. Describe the procedures used for boring holes.
6. Describe the procedures used to perform facing operations.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined before are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

MW-2020

ABRASIVES

Outcomes:

Upon successful completion of this unit, the apprentice will be able to:

- demonstrate knowledge of abrasives, grinding wheels and their characteristics.

Objectives and Content:

ABRASIVES

1. 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
 - vii) cubic boron nitrate
 - viii) coated
 - ix) lapping
 - x) loose
 - xi) compound
2. Describe the processes involved in grinding wheel manufacture.
3. List and describe the factors involved in selection of a grinding wheel.

Abrasive

 - i) grain
 - ii) grade
 - iii) structure
 - iv) bond
 - v) application
 - vi) shapes
4. Locate and interpret grinding wheel codes.
5. Identify types of grinding wheels and describe their characteristics and applications.
6. Describe the procedures for inspecting grinding wheels.
7. Describe safety procedures pertaining to grinding wheels and machines.

8. Identify coated abrasives and describe their characteristics, construction and applications.
9. Describe the types of manufactured diamonds and their characteristics.
10. Describe methods used to perform lapping operations and their associated procedures.
11. Describe methods used to perform honing operations and their associated techniques and procedures.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined before are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Select a grinding wheel and dress it for specified material.

MW-2030

CYLINDRICAL GRINDERS

Outcomes:

Upon successful completion of this unit, the apprentice will be able to:

- set up and perform a variety of operations on a cylindrical grinder.

Objectives and Content:

1. Describe cylindrical grinders, their types, parts, characteristics and applications.
2. Describe the procedures used to plan the sequence for grinding operations.
3. Describe the procedures used to align grinder heads, tables and fixtures.
4. Describe the procedures used to select speeds, feeds and depth of cuts.
5. Describe potential problems during grinding operations, their causes and remedies.
6. Describe the principles and procedures used to parallel grind an internal/external diameter and plunge.
7. Describe the procedures used to carry out toolpost grinding.
8. Describe operating principles of a centreless grinder.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined before are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Grind a workpiece face, internal/external diameter, tapers, plunge and shoulder.

MW-2040 UNIVERSAL CUTTER AND TOOL GRINDER

Outcomes:

Upon successful completion of this unit, the apprentice will be able to:

- set up and operate a universal cutter and tool grinder.

Objectives and Content:

UNIVERSAL CUTTER AND TOOL GRINDER

1. Describe tool and cutter grinders, their parts, applications and safety precautions.
2. Describe tool cutter nomenclature.
3. Describe tool cutter grinder accessories and their applications.
4. Describe the procedures used to set up a tool and cutter grinder.
5. Describe methods used for calculating, grinding and checking clearance angles.
6. Describe the procedures used to set up and sharpen a cutter using a tool and cutter grinder.
7. Describe the procedures used to grind clearance angles.
 - i) clearance grinding
 - ii) hollow grinding
 - iii) circle grinding
8. Describe potential problems that might be encountered during operations, their causes and remedies.
9. Describe preventative maintenance procedures for tool and cutter grinders.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined before are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Check cutter clearance angle using appropriate method.
2. Set up and sharpen a cutter using a tool cutter grinder.
3. Grind primary and secondary angles.

MW-2050 ELECTRICAL DISCHARGE MACHINES

Outcomes:

Upon successful completion of this unit, the apprentice will be able to:

- demonstrate knowledge of electrical discharge machines, their setup and operation.

Objectives and Content:

1. Describe safety precautions relating to using Electrical Discharge Machines (EDM).
2. Describe EDM, their characteristics and applications.
 - i) die sink
 - ii) wire feed
3. Describe the planning sequence for EDM operations.
4. Describe the procedure used to remove broken taps.
5. Describe the types of electrodes, their characteristics and applications.
6. Describe the process and factors used to select wire size.
7. Describe the process and factors involved in selecting current.
8. Describe the procedures and factors involved in selecting cutting speeds and feeds.
9. Describe the procedures used to load programs.
10. Describe the procedures used to cut work pieces using EDM.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined before are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

MW-2060

NC / CNC OF MACHINE TOOLS

Outcomes:

Upon successful completion of this unit, the apprentice will be able to:

- demonstrate knowledge of NC / CNC machines, their operating principles and applications.
- create simple part program.

Objectives and Content:

1. Describe the development of the computer applied to the control of machine tools.
2. Describe the principles and applications of the Cartesian coordinates and guidelines for their use.
3. Describe the characteristics of NC / CNC.
 - i) machine tool movement
 - ii) accuracy
 - iii) reliability
 - iv) repeatability
 - v) productivity
4. Describe the main and secondary axes and the relationship between them.
5. Identify the types of NC / CNC machines and describe their characteristics and applications.
 - i) type
 - ii) size
 - iii) turning centre
 - iv) combination
 - v) vertical
 - vi) horizontal
6. Identify the types of accessories associated with NC / CNC machines and describe their applications and procedures for use.
 - i) tool changers
 - ii) accessories
 - iii) tool holders
 - iv) work holding devices

7. Describe the procedures used for setting up the NC / CNC centre.
 - i) simple programming and program notes
 - ii) setting part zero
 - iii) setting tool offset
 - iv) standard size machining centres

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined before are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

MW-2070

CNC PROGRAMMING

Outcomes:

Upon successful completion of this unit, the apprentice will be able to:

- demonstrate knowledge of control unit functions.
- demonstrate knowledge of access units and codes.
- prepare a manual part program.

Objectives and Content:

1. Describe control unit functions.
2. Identify types of controllers and describe their characteristics and applications.
3. Describe access units and codes.
4. Analyze drawings for CNC operation.
5. Plan sequence of operations for CNC.
6. Describe the procedures used to set up a CNC machine.
7. Describe the procedures used to operate a CNC machine.
8. Describe preventative maintenance procedures.
9. Identify the different cycles and describe their applications and advantages.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined before are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

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.

MW-2080

MECHANICAL FASTENERS

Outcomes:

Upon successful completion of this unit, the apprentice will be able to:

- select and use fasteners.
- drill and tap screw locations.

Objectives and Content:

MECHANICAL FASTENERS

1. Identify types of fasteners and locators and describe their characteristics and applications.
 - i) rivets
 - ii) keys
 - iii) splines
 - iv) bonds
 - v) nuts
 - vi) dowel pins
 - vii) washers
 - viii) screws
 - ix) studs
 - x) lock wires
 - xi) snap rings
 - xii) bolts
 - xiii) self-locking nuts
2. Identify head styles of threaded fasteners.
3. Identify nut designs and describe their applications.
4. Describe the grades of nuts and bolts.
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. Describe the various key seats and keyways and the characteristics of each.
7. Explain the principles of stepped keys.
8. Describe the procedure used to torque bolts.

9. Describe the procedure used to broach a keyway.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined before are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

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

MW-2090 BEVEL, HELICAL AND WORM GEARS

Outcomes:

Upon successful completion of this unit, the apprentice will be able to:

- demonstrate knowledge of the various types of gears.
- set up and perform gear milling operations.

Objectives and Content:

BEVEL GEARS

1. Identify the types of bevel gears and their characteristics.
2. Describe the procedures used to set up and mill bevel gears using indexing heads.
3. Describe the procedures used to calculate and mill bevel gears.

HELICAL GEARS

4. Describe the different types of helical gears and their applications.
5. Describe the various applications of helical gears.
6. Describe the procedure for milling helical gears using indexing heads.
7. Describe the procedures used to calculate and mill helical gears.

WORM GEARS

8. Identify the types of worm gears and their use.
9. Describe the calculations for the parts of a worm gear.
 - i) addendum
 - ii) center distance
 - iii) dedendum clearance
 - iv) face width
 - v) lead of worm thread
 - vi) lead angle
 - vii) OD
 - worm
 - worm gear

- viii) pitch
 - worm
 - worm gear
- ix) pitch diameter
 - worm
 - worm gear
- x) rubbing speed (fpm)
- xi) throat diameter
- xii) radius of rim corner
- xiii) throat radius
- xiv) ratio
- xv) tooth depth
- xvi) worm thread length

10. Describe the procedures used for hobbing gears.
11. Describe specialty gear cutting equipment.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined before are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Mill bevel gear using an indexing head.
2. Perform speed and feed calculations.
3. Mill a helical gear.
4. Perform bevel gear and helical gear calculations.

MW-2100

SURFACE GRINDERS

Outcomes:

Upon successful completion of this unit, the apprentice will be able to:

- set up and perform a variety of grinding operations.

Objectives and Content:

SURFACE GRINDER

1. Describe the principles of the grinding process.
2. Identify types of surface grinders and describe their characteristics and applications.
3. Describe the procedures used to test a grinding wheel on a surface grinding wheel flange.
4. Describe the procedures used to mount a grinding wheel.
5. Describe the procedures used to balance a grinding wheel.
6. Describe the procedures and precautions used for truing and dressing a grinding wheel.

WORK HOLDING DEVICES

7. Identify types of magnetic chucks and describe their operating principles and characteristics.
8. Identify magnetic chuck accessories and describe their applications.
 - i) adapter plate
 - ii) magnetic chuck blocks
 - iii) sine chuck
 - iv) Magna-vise clamps
 - v) double-face taper
 - vi) special fixtures
9. Describe the procedures used to align grinder heads, tables and fixtures.
10. Describe the various types of grinding fluids.
11. Describe the methods of applying coolants.

12. Describe the factors that affect surface finish.

SURFACE GRINDING OPERATIONS

13. Describe the procedures used for mounting work pieces.
14. Describe safety procedures used for grinder setup and operation.
15. Describe the procedures used to set up and perform grinding operations on a surface grinder.
 - i) cut off parts
 - ii) grind surfaces and shapes
16. Describe the procedures used for dressing a convex radius on a grinding wheel.
17. Identify and correct problems during grinding operations.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are mandatory in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Balance a grinding wheel.
2. Grind flat surface up to a shoulder.
3. Grind workpiece edges.
4. True and dress a grinding wheel.

MW-2110

ELECTRICAL ARC WELDING

Outcomes:

Upon successful completion of this unit, the apprentice will be able to:

- set up and use electric welding equipment
- locate and use information contained in drawings

Objectives and Content:

1. Describe safe practices associated with arc welding.
 - i) eye and face protection
 - ii) safety goggles
 - iii) welding shields
 - iv) welding screens
 - v) ventilation (local exhausts)
 - vi) freely movable hood
 - vii) fixed enclosure
 - viii) down draft benches
 - ix) confined spaces
 - x) electric shock hazards
2. Describe procedures used for set up and operation of electric arc welding equipment.
 - i) AC and DC machines
 - ii) straight and reverse polarity
 - iii) grounding methods
 - iv) electrode holders
 - v) amperage setting for various electrodes
3. Explain the numbering system for electrodes.
 - i) tensile strength
 - ii) welding position (recommend for the electrode)
 - iii) penetration
4. Describe types of joints encountered in welding.
 - i) butt
 - ii) tee
 - iii) lap
5. Describe three basic welding positions.
 - i) flat
 - ii) vertical
 - iii) horizontal

6. Identify and interpret welding symbols commonly found on blueprints.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Weld butt joint.
2. Build up on a piece of shafting and machine.

MW-2120 OXY-FUEL CUTTING AND WELDING

Outcomes:

Upon successful completion of this unit, the apprentice will be able to:

- set up and use oxy fuel welding equipment.

Objectives and Content:

1. Describe safe practices relating to the operation of oxygen and acetylene equipment.
 - i) properties of oxygen, acetylene, and propane
 - ii) handling and transporting cylinders
 - iii) storage of cylinders
 - iv) 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
2. Describe procedures used to set-up and use welding equipment. (OFW)
 - i) safety precautions
 - ii) inspection of work area for possible hazards
 - iii) equipment
 - set up
 - adjustment
 - check for leaks
 - iv) light-up procedure
 - v) flame adjustment
 - vi) shut down procedures
 - vii) storage
3. 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
4. Describe the procedure to perform cutting using oxygen fuel equipment.

5. Describe the procedures used to perform brazing.
6. Describe the procedures used to perform silver soldering.
7. Describe the procedure to perform soft soldering.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Set up and use oxy-fuel welding equipment
 - cut mild steel freehand
 - perform silver soldering

MW-2130

**ELECTRO-CHEMICAL MACHINING
AND ELECTROLYTIC GRINDING**

Outcomes:

Upon successful completion of this unit, the apprentice will be able to:

- demonstrate knowledge of the process and applications of electrochemical grinding.
- demonstrate knowledge of the process and applications of electrolytic grinding.

Objectives and Content:

ELECTRO-CHEMICAL MACHINING

1. Describe safety precautions to observe when using electro-chemical machining.
2. Describe the principles and practices of electro-chemical machining.
3. Identify the electrolyte and describe its characteristics and operating principles.
4. Identify the electrode tool and describe how it works.
5. Describe the characteristics required from the materials used to make electrode tools.
6. Describe the elements that affect the metal removal rate in electro-chemical machining.

ELECTROLYTIC GRINDING

7. Describe safety precautions to observe when using electrolytic grinding machines.
8. Describe the principles and applications of electrolytic grinding.
 - i) advantages
 - ii) disadvantages
9. Describe the type of grinding wheel used in electrolytic grinding and the procedure for truing.
10. Describe the purpose of the electrolyte and the principles of its operation.
11. Describe the elements that affect the surface finish and the types of finishes that can be produced through electrolytic grinding.

12. Describe the methods and procedures used in electrolytic grinding.
- i) cylindrical
 - ii) form
 - iii) plunge
 - iv) surface
 - v) traverse

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

- 1.

MW-2140 ADVANCE CNC OPERATION (NL ONLY)

Course Outcomes:

Upon completion of this course, the apprentice will be able to:

- describe and perform the procedures used in performing advanced machining operations on a CNC lathe and mill.
- plan a sequence of operation to produce a part using multiple tools.

Objectives and Content:

1. Analyze drawing for CNC operation.
2. Identify the following axis and codes:

i) X	vi) K
ii) Y	vii) U
iii) Z	viii) V
iv) I	ix) W
v) J	x) C
3. Identify and describe aspects of part programs:
 - i) programming codes (modal and non-modal)
 - ii) cycles
 - iii) sub-programs
4. Describe the sequence of operations for operating the CNC using multiple tools.
5. Identify and describe the procedure to perform the following tool entry methods:
 - i) plunge
 - ii) helical
 - iii) ramp
6. Describe various manual data input techniques.
7. Describe the procedure to set up a CNC lathe.
8. Describe the procedure to set up and operate the CNC milling center.

9. Describe the procedure to perform the following CNC processes.
- | | |
|------------------------------------|-----------------------------------------|
| i) rough turning | viii) chamfer |
| ii) finish turning | ix) profiling |
| iii) threading (internal/external) | x) drilling |
| iv) grooving | xi) tapping |
| v) boring | xii) pocketing (rectangular & circular) |
| vi) taper turning | xiii) tool offsets |
| vii) radius turning | xiv) cutter compensation (left/right) |
10. Describe various manual data input techniques.

Practical:

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are **mandatory** in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick.

1. Manually write a program for both the CNC lathe and mill.
2. Save program to disc.
3. Perform the following:
 - i) rough and finish turning
 - ii) threading (external)
 - iii) taper turning (internal and external)
 - iv) boring
 - v) radius/chamfer turning
 - vi) grooving
 - vii) pocketing
 - viii) drilling
4. Input program by manual data input or disc.
5. Select and set up tooling.
6. Select and set up holding devices.
7. Set tooling off sets.
8. Test run the program.
9. Produce a finished part.

MA-1060

BASIC MATH

Description:

This course in Basic Math requires knowledge of general mathematical concepts and processes to enable trades persons to function in the institutional setting by developing numeracy skills required for technical courses. This math course should also provide a foundation for experiential learning through a knowledge of math relating to on-the-job skills and practices.

Course Outcomes:

1. To develop numeracy skills and knowledge required for institutional and on-the-job learning.
2. To develop the capability to apply mathematical concepts in the performance of trade practices.
3. To develop an appreciation for mathematics as a critical element of the learning environment
4. To use mathematical principles accurately for the purposes of problem solving, job and materials estimation, measurement, calculation, system conversion, diagram interpretation and scale conversions, formulae calculations, and geometric applications.

Prerequisites:

Course Duration: 60 hrs.

Course Objectives (Knowledge):

1. Define and calculate using whole number operations
2. Define and demonstrate use of correct orders of operations
3. Demonstrate examples of operations with fractions and mixed numbers
4. Demonstrate examples of operations with decimals
5. Demonstrate examples of operations with percentages
6. Employ percent/decimal/fraction conversion and comparison

7. Define and calculate with ratios and proportions
8. Use the Imperial Measurement system in relevant trade applications
9. Use the Metric Measurement system in relevant trade applications
10. Perform Imperial/Metric conversions
11. Define and demonstrate the formulation of variables
12. Demonstrate and define the various properties of angles and make relevant calculations

Major Tasks/Sub-tasks (Skills):

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

REQUIRED RELATED COURSES

CM-2150 WORKPLACE COMMUNICATIONS

Description:

This course is designed to introduce students to the principles of effective communication including letters, memos, short report writing, oral presentations and interpersonal communications.

Course Outcomes:

Upon completion of the course, students will be able to:

- understand and apply communication skills as outlined in the Employability Skills 2000, Conference Board of Canada
- understand the importance of well-developed writing skills in business and in career development.
- understand the purpose of the various types of business correspondence.
- examine the principles of effective business writing.
- examine the standard formats for letters and memos.
- write effective letters and memos.
- examine the fundamentals of informal reports and the report writing procedure.
- produce and orally present an informal report
- examine effective listening skills and body language in communication

Objectives and Content:

1. Apply rules and principles for writing clear, concise, complete sentences which adhere to the conventions of grammar, punctuation, and mechanics.
2. Explain the rules of subject-verb agreement.
3. Define and describe the major characteristics of an effective paragraph
4. Examine the Value of Business Writing Skills
 - i) Describe the importance of effective writing skills in business
 - ii) Describe the value of well-developed writing skills to career success as referenced in the Employability Skills
5. Examine Principles of Effective Business Writing
 - i) Discuss the rationale and techniques for fostering goodwill in business communication, regardless of the circumstances
 - ii) Review the importance of revising and proofreading
 - iii) Differentiate between letter and memo applications in the workplace & review samples
 - iv) Identify the parts of a business letter and memo

- v) Review the standard formats for business letters and memos
 - vi) Examine samples of well-written and poorly written letters and memos
 - vii) Examine guidelines for writing sample letters and memos which convey: acknowledgment, routine request, routine response, complaint, refusal, persuasive request and letters of appeal.
6. Examine the Fundamentals of Informal Business Reports
- i) Identify the purpose of the informal report
 - ii) Identify the parts and formats of an informal report
 - iii) Identify methods of information gathering
 - iv) Describe the methods of referencing documents
 - v) Review the importance of proof reading and editing
7. Examine types of presentations
- i) Review & discuss components of an effective presentation
 - ii) Review & discuss delivery techniques
 - iii) Review & discuss preparation & use of audio/visual aids
 - iv) Discuss & participate in confidence building exercises used to prepare for giving presentations
8. Interpersonal Communications
- i) Examine and apply listening techniques
 - ii) Discuss the importance of body language

Practical:

1. Write well-developed, coherent, unified paragraphs which illustrate the following: A variety of sentence arrangements; conciseness and clarity; and adherence to correct and appropriate sentence structure, grammar, punctuation, and mechanics.
2. Write sample letters and memos which convey: acknowledgment, routine request, routine response, complaint, refusal, persuasive request and letters of appeal.
3. Gather pertinent information, organize information into an appropriate outline & write an informal report with documented resources.
 - i) Edit, proofread, and revise the draft to create an effective informal report and present orally using visual aids
 - ii) Participate in confidence building exercises
4. Present an effective presentation.
5. Evaluate presentations.

MR-1220

CUSTOMER SERVICE

Description:

This course focuses on the role of providing quality customer service. It is important to have a positive attitude and the necessary skills to effectively listen and interpret customer concerns about a product, resolve customer problems, and determine customer wants and needs. Students will be able to use the skills and knowledge gained in this course to effectively provide a consistently high level of service to the customer.

Course Outcomes:

Upon successful completion of this course, students will be able to:

- define customer service
- explain why service is important
- describe the relationship between “service” and “sales”
- demonstrate an understanding of the importance of a positive attitude
- demonstrate methods of resolving customer complaints

Objectives and Content:

1. Define quality service
 - i) Identify and discuss elements of customer service
 - ii) Explain the difference between Service vs. Sales or Selling
 - iii) Explain why quality service is important
 - iv) Identify the various types of customers & challenges they may present
 - v) Describe customer loyalty
 - vi) Examine barriers to quality Customer Service
2. Explain how to determine customers wants and needs
 - i) Identify customer needs
 - ii) Explain the difference between customer wants and needs
 - iii) Identify ways to ensure repeat business
3. Demonstrate an understanding of the importance of having a positive attitude
 - i) Identify & discuss the characteristics of a positive attitude
 - ii) Explain why it is important to have a positive attitude
 - iii) Explain how a positive attitude can improve a customer’s satisfaction
 - iv) Define perception and explain how perception can alter us and customers
 - v) Describe methods of dealing with perception

4. Communicating effectively with customers
 - i) Describe the main elements in the communication process
 - ii) Identify some barriers to effective communication
 - iii) Explain why body language is important
 - iv) Define active listening and state why it is important
 - v) Identify and discuss the steps of the listening process
 - vi) Identify and discuss questioning techniques

5. Demonstrate using the telephone effectively
 - i) Explain why telephone skills are important
 - ii) Describe the qualities of a professional telephone interaction

6. Demonstrate an understanding of the importance of asserting oneself
 - i) Define assertiveness
 - ii) Discuss assertive techniques
 - iii) Explain the use of assertiveness when dealing with multiple customers

7. Demonstrate techniques for interacting with challenging customers in addressing complaints & resolving conflict
 - i) Examine & discuss ways to control feelings
 - ii) Examine & discuss ways to interact with an upset customer
 - iii) Examine & discuss ways to resolve conflict/customer criticism
 - iv) Examine & discuss ways to prevent unnecessary conflict with customers

Practical:

1. Participate in activities to demonstrate knowledge of the course objectives.

SP-2330 QUALITY ASSURANCE/QUALITY CONTROL

Description:

This course is designed to give students an understanding of the concepts and requirements of QA/QC such as, interpreting standards, controlling the acceptance of raw materials, controlling quality variables and documenting the process. It includes information on quality concepts, codes and standards, documentation, communications, human resources, company structure and policy, teamwork and responsibilities.

Course Outcomes:

Upon completion of this course, students will be able to:

- develop the skills and knowledge required to apply quality assurance/quality control procedures as related to the trade
- develop an awareness of quality principles and processes
- apply quality assurance/quality control procedures in a shop project

Objectives & Content:

1. Describe the reasons for quality assurance and quality plans.
2. Explain the relationship between quality assurance and quality control.
3. Describe quality control procedures as applied to the production and checking of specifications and processes in applicable occupations.
4. Describe quality control procedures as applied to the acceptance and checking of raw materials.
5. Explain the role of communications in a quality environment.
6. Explain why it is important for all employees to understand the structure of the company and its production processes.
7. Explain how human resource effectiveness is maximized in a quality managed organization.
8. Explain the role of company policy in quality management.
9. Explain the purpose of codes and standards in various occupations.

10. Explain the concepts of quality
 - i) cost of quality
 - ii) measurement of quality
 - iii) elements of quality
 - iv) elements of the quality audit
 - v) quality standards
 - vi) role expectations and responsibilities

11. Explain the structure of quality assurance and quality control
 - i) Describe organizational charts
 - ii) Identify the elements of a quality assurance system such as ISO, CSA, WHMIS, Sanitation Safety Code (SSC)
 - iii) Explain the purpose of the quality assurance manual
 - iv) Describe quality assurance procedures

12. Examine quality assurance/quality control documentation
 - i) Describe methods of recording reports in industry
 - ii) Describe procedures of traceability (manual and computer-based recording)
 - iii) Identify needs for quality control procedures

Practical:

1. Apply quality control to a project
 - i) Follow QA/QC procedures for drawings, plans and specifications in applicable occupations.
 - ii) Calibrate measuring instruments and devices in applicable occupations.
 - iii) Interpret required standards
 - iv) Follow QA/QC procedures for accepting raw materials
 - v) Carry out the project
 - vi) Control the quality elements (variables)
 - vii) Complete QA/QC reports

MC-1050 INTRODUCTION TO COMPUTERS

Description:

This course is designed to give the student an introduction to computer systems. Particular emphasis is given to word processing, spreadsheet, e-mail and the Internet and security issues.

Course Outcomes:

Upon completion of this course, students will have a basic understanding of:

- computer systems and their operation.
- popular software packages, their applications
- security issues of Computers

Objectives & Content:

1. Identify the major components of microcomputer system hardware and software system.
2. Describe the functions of the microprocessor.
 - i) Describe and give examples of I/O DEVICES.
 - ii) Describe primary storage (RAM, ROM, Cache).
 - iii) Define bit, byte, code and the prefixes k.m. and g.
 - iv) Describe secondary storage (diskettes and hard disks, CDROMS, Zip Drives etc).
 - v) Describe how to care for a computer and its accessories.
3. Describe microcomputer software
 - i) Define software.
 - ii) Describe types of operational and application software
 - iii) Define file and give the rules for filenames and file extensions.
4. Describe windows software
 - i) Start and quit a Program
 - ii) Demonstrate how to use the help function
 - iii) Locate a specific file using the **find** function
 - iv) Identify system settings: wall paper, screen saver, screen resolution, background
 - v) Start a program by using the Run Command
 - vi) Shutting down your computer

5. Identify File Management commands
 - i) Demonstrate how to view directory structure and folder content
 - ii) Organize files and folders
 - iii) Copy, delete, and move files and folders
 - iv) Create folders
 - v) Maximize and minimize a window
 - vi) Describe windows task bar

6. Describe Keyboards
 - i) Identify and locate alphabetic and numeric keys
 - ii) Identify and locate function key & special keys

7. Describe Word Processing
 - i) Describe Windows components
 - ii) Menu bar
 - iii) Menu indicators
 - iv) Document window
 - v) The Status bar
 - vi) The Help feature
 - vii) Insertion point movements

8. Describe the procedure used to development of a document
 - i) Enter text
 - ii) Change the display

9. Describe the procedure for opening, saving and exiting documents
 - i) Saving a document
 - ii) Closing a document.
 - iii) Starting a new document Window
 - iv) Opening a document
 - v) Exiting word processor

10. Describe the procedure for editing a Document
 - i) Adding new text
 - ii) Deleting text
 - iii) Using basic format enhancement (split and join paragraphs, insert text)

11. Describe the main Select Features
 - i) Identify a selection
 - ii) Moving a selection
 - iii) Copying a selection
 - iv) Deleting a selection
 - v) Saving a selection

12. Explain how to change Layout Format
 - i) Changing layout format: (margins, spacing, alignment, paragraph indent, tabs, line spacing, page numbering)
13. Explain how to change Text Attributes
 - i) Changing text attributes: (bold, underline, font, etc.)
14. Describe the Auxiliary Tools
 - i) Using Spell Check & Thesaurus
15. Describe Print features
 - i) Selecting the Print Feature: (i.e; number of copies and current document)
 - ii) Identifying various options in print screen dialogue box
16. Examine & Discuss Electronic Spreadsheet
 - i) Spreadsheet Basics
 - ii) The Worksheet Window
17. Describe Menus
 - i) Menu Bar
 - ii) Control menu
 - iii) Shortcut menu
 - iv) Save, Retrieve form menus
18. Describe the components of a worksheet
 - i) Entering constant values and formulas
 - ii) Using the Recalculation feature
19. Describe Use ranges
 - i) Typing a range for a function
 - ii) Pointing to a range for a function
 - iii) Selecting a range for toolbar and menu commands
20. Describe how to print a worksheet
 - i) Printing to the Screen
 - ii) Printing to the Printer
 - iii) Printing a selected Range
21. Describe how to edit a worksheet
 - i) Replacing cell contents
 - ii) Inserting & deleting rows and columns
 - iii) Changing cell formats

- iv) Changing cell alignments
 - v) Changing column width
 - vi) Copying and moving cells
22. State major security issues in using computers
- i) Pass words
 - ii) Accessing accounts
 - iii) Viruses and how they can be avoided
 - iv) Identity theft and ways to protect personal information
23. Describe how to use Electronic Mail
- i) E-mail etiquette
 - ii) E-mail accounts
 - iii) E-mail messages
 - iv) E-mail message with attachments
 - v) E-mail attachments
 - vi) Print e-mail messages
 - vii) Deleting e-mail messages
24. Explain the Internet and its uses
- i) The World Wide Web(www)
 - ii) Accessing Web sites
 - iii) Internet Web Browsers
 - iv) Internet Search Engines
 - v) Searching Techniques
 - vi) Posting documents on-line

Practical:

1. Create a document using Word Processing.
2. Complete word processing exercises to demonstrate proficiency in word processing
3. Prepare and send e-mails with attachments
4. Retrieve documents and e-mail attachments and print copies
5. Develop & print a spread sheet.
6. Post a document on-line

SD-1700

WORKPLACE SKILLS

Description:

This course involves participating in meetings, information on formal meetings, unions, workers' compensation, employment insurance regulations, workers' rights and human rights.

Course Outcomes:

Upon completion of this course, students will be able to:

- Participate in meetings
- Define and discuss basic concepts of:
 - unions
 - workers' compensation
 - employment insurance
 - workers' rights
 - human rights
 - workplace diversity
 - gender sensitivity

Objectives & Content:

1. Meetings
 - i) Identify & discuss meeting format and preparation required for a meeting.
 - ii) Explain the purpose of an agenda.
 - iii) Explain the roles and responsibilities of meeting participants.
 - iv) Explain the purpose of motions and amendments and withdrawals.
 - v) Explain the procedure to delay discussion of motions.
 - vi) Explain the voting process.
2. Unions
 - i) State why unions exist.
 - ii) Give a concise description of the history of Canadian labour.
 - iii) Explain how unions function.
 - iv) Explain labour's structure.
 - v) Describe labour's social objectives.
 - vi) Describe the relationship between Canadian labour and the workers.
 - vii) Describe the involvement of women in unions.
3. Worker's Compensation
 - i) Describe the aims, objectives, benefits and regulations of the Workplace Health, safety and Compensation Commission.
 - ii) Explain the internal review process.

4. Employment Insurance
 - i) Explain employment insurance regulations
 - ii) Describe how to apply for employment insurance.
 - iii) Explain the appeal process.
 - iv) Identify the components of a letter of appeal.

5. Worker's Rights
 - i) Define labour standards.
 - ii) Explain the purpose of the Labour Standards Act.
 - iii) Identify regulations pertaining to:
 - Hours of work
 - Minimum wages
 - Employment of children
 - Vacation pay
 - iv) Explain the purpose of the Occupational Health & Safety Act as it refers to workers' rights

6. Human Rights
 - i) Describe what information cannot be included on an employment application.
 - ii) Describe what information cannot be included in an interview.
 - iii) Examine the Human Rights Code and explain the role of the Human Rights Commission.
 - iv) Define harassment in various forms and identify strategies for prevention.

7. Workplace Diversity
 - i) Define and explore basic concepts and terms related to workplace inclusively including age, race, culture, religion, socio-economic, sexual orientation with an emphasis on gender issues and gender stereotyping.

8. Gender Sensitivity
 - i) Explore gender and stereotyping issues in the workplace by identifying strategies for eliminating gender bias.

Practical:

1. Prepare an agenda.
2. Participate in a meeting.
3. Analyze a documented case of a human rights complaint with special emphasis on the application, time frame, documentation needed, and legal advice available.

SD-1710

JOB SEARCH TECHNIQUES

Description:

This course is designed to give students an introduction to the critical elements of effective job search techniques.

Course Outcomes:

Upon completion of this course, students will be able to:

- Demonstrate effective use of Job Search Techniques

Objectives & Content:

1. Identify and examine employment trends and opportunities
2. Identify sources that can lead to employment
3. Access and review information on the Newfoundland and Labrador Apprenticeship and Certification Web site and the Apprenticeship Employment Gateway
4. Analyze job ads and discuss the importance of fitting qualifications to job requirements
5. Identify and discuss employability skills as outlined by the Conference Board of Canada.
6. Discuss the necessity of fully completing application forms.
7. Establish the aim/purpose of a resume
8. Explore characteristics of effective resumes, types of resumes, and principles of resume format .
9. Explore characteristics of an effective cover letter.
10. Identify commonly asked questions in an interview.
11. Explore other employment related correspondence.
12. Explore the job market to identify employability skills expected by an employer.

13. Conduct a self-analysis and compare with general employer expectations.
14. Discuss the value of establishing and maintaining a portfolio.

Practical:

1. Complete sample application forms.
2. Write a resume.
3. Write an effective cover letter.
4. Establish a portfolio.
5. Write out answers to commonly asked questions asked during interviews.
6. Identify three potential employers from the Apprenticeship Employment gateway, Apprenticeship & Certification web site.

SD-1720 ENTREPRENEURIAL AWARENESS

Description:

This course is designed to introduce the student to the field of entrepreneurship, including the characteristics of the entrepreneur, the pros and cons of self-employment, and some of the steps involved in starting your own business.

Course Outcomes:

Upon completion of this course, the student will be able to:

- Identify the various types of business ownership, the advantages and disadvantages of self-employment and identify the characteristics of an entrepreneur.
- State the purpose and identify the main elements of a business plan.

Objectives & Content:

1. Explore Self-Employment: An Alternative to Employment
 - i) Identify the advantages and disadvantages of self-employment vs. regular employment
 - ii) Differentiate between an entrepreneur and a small business owner
 - iii) Evaluate present ideas about being in business
2. Identify and discuss various types of business ownership
 - i) Explore the Characteristic of Entrepreneurs
 - ii) Identify characteristics common to entrepreneurs
 - iii) Compare one's own personal characteristics with those of entrepreneurs.
 - iv) Examine one's present ideas about business people
3. Identify Business Opportunities
 - i) Distinguish between an opportunity and an idea.
 - ii) Examine existing traditional and innovative business ventures
 - iii) Identify and summarize the role of various agencies that support business development.
 - iv) Identify potential business opportunities.
4. Review the Entrepreneurial Process.
 - i) Explain the entrepreneurial process
 - ii) Describe the purpose of a business plan
 - iii) Identify & discuss the main elements of a business plan

Practical:

1. From a list potential business opportunities prepare a list of elements that would have to be included in a business plan.