COURSE FAB2140: PRECISION MILLING 1

Level: Intermediate

Theme: Production Systems and Processes

Prerequisite: FAB1130 Principles of Machining

Description: Students develop basic milling skills to shape and finish common machineable metals and plastics.

Parameters Access to a fabrication work centre complete with vertical and/or horizontal mill and accessories and to instruction from an individual with specialized training in machining practices.

Curriculum and Assessment Standards

General Outcomes	Assessment Criteria and Conditions	Suggested Emphasis
The student will: • identify health and safety hazards specific to milling operations, and take preventive measures to avoid accidents and personal injury to self and others	*Assessment of student achievement should be based on:* • observed performance related to: – appropriate selection and use of personal protective equipment – containment of long hair, loose clothing, removal of rings and other forms of jewellery – safe handling of materials – keeping a clean and orderly work area	10
• perform safe milling machine set-up, operation and shut-down procedures	• demonstration of approved practices related to the safe set-up of a vertical and/or horizontal mill. *Assessment Tool* *Equipment Checklist: Milling Machines, FABEQUIP–4* *Standard* *All procedures to be performed correctly*	15

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COURSE FAB2140: PRECISION MILLING 1 (continued)

General Outcomes	Assessment Criteria and Conditions	Suggested Emphasis
The student will: • demonstrate basic milling machine skills and practices	*Assessment of student achievement should be based on:* • completion of a milled part that incorporates square and bevelled surfaces using a vertical and/or horizontal mill. *Assessment Tool* *Fabrication Process: Mill Work, FAB2140–1* *Illustrative Example: Aluminum Dice, FAB2140–2* *Standard* *Dimensions and quality of finish are to be within stated tolerances and specifications* *Performance rating of 2 for each applicable task*	75
• demonstrate basic competencies.	• observations of individual effort and interpersonal interaction during the learning process. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Outcomes	Notes
Orientation	*The student should:*	
• Health and Safety	• observe all safety procedures related to the use and operation of metal milling equipment • describe a safety plan in case of accident	
• Mill Parts and Accessories	• identify and describe the basic parts and accessories of a milling machine • compare the operation and uses of a vertical mill to a horizontal mill • identify and describe the types of cutters used in vertical and horizontal milling according to their size, construction and purpose; e.g.: – plain milling – side milling – end milling cutters	Describe the two basic types of milling machines and the types of surfaces and features they are able to produce.

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COURSE FAB2140: PRECISION MILLING 1 (continued)

Concept	Specific Outcomes	Notes
	The student should:	
• Lubricants and Cutting Fluids	• use the recommended lubricants for a given milling machine • identify the purpose of a cutting fluid and identify common types	Refer to product labels and instructions for proper use and handling.
• Machine Operation	• research typical set-up procedures for horizontal and/or vertical milling to create flat surfaces, grooves and chamfers • identify the factors that determine cutting speeds, feed rates and depths of cuts • explain the advantages and disadvantages of upcutting and climb milling.	Do not attempt climb milling without backlash eliminators.
Planning and Management		
• Print Reading	• identify from a machine drawing of a milled part, the: – overall dimensions and tolerance – quality of surface finish – most appropriate milling machine and cutters to be used	
• Squaring Operations	• list and describe the machining operations to square stock, bevel and chamfer surfaces • calculate the appropriate cutting speeds, feed rates and depth of cuts for a specific operation.	
Implementation		
• Milling	• demonstrate basic competencies using a milling machine to rough size, square, bevel, chamfer and finish machine parts to the prescribed tolerances and specification.	
Assessment		
• Quality Control	• research ways to improve output quality and machining time	
• Career Preparation	• prepare a record of completed activities within a portfolio.	

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