



## COURSE OUTLINE: MAC305 - CMPLX MILLING TECH

Prepared: Peter Corbett

Approved: Corey Meunier, Chair, Technology and Skilled Trades

<b>Course Code: Title</b>	MAC305: COMPLEX MILLING TECHNOLOGY
<b>Program Number: Name</b>	6347: GENERAL MACHINIST L3
<b>Department:</b>	MECHANICAL TECHNIQUES PS
<b>Semesters/Terms:</b>	21F, 22W, 22F
<b>Course Description:</b>	This course is designed to provide Level III General Machinist Apprentices the ability to demonstrate milling of complex geometric shapes.
<b>Total Credits:</b>	6
<b>Hours/Week:</b>	3
<b>Total Hours:</b>	42
<b>Prerequisites:</b>	There are no pre-requisites for this course.
<b>Corequisites:</b>	There are no co-requisites for this course.
<b>Vocational Learning Outcomes (VLO's) addressed in this course:</b>	<b>6347 - GENERAL MACHINIST L3</b> VLO 1 General Machinist - L3
<small>Please refer to program web page for a complete listing of program outcomes where applicable.</small>	
<b>Essential Employability Skills (EES) addressed in this course:</b>	EES 1 Communicate clearly, concisely and correctly in the written, spoken, and visual form that fulfills the purpose and meets the needs of the audience. EES 2 Respond to written, spoken, or visual messages in a manner that ensures effective communication. EES 3 Execute mathematical operations accurately. EES 5 Use a variety of thinking skills to anticipate and solve problems. EES 8 Show respect for the diverse opinions, values, belief systems, and contributions of others. EES 9 Interact with others in groups or teams that contribute to effective working relationships and the achievement of goals. EES 10 Manage the use of time and other resources to complete projects.
<b>Course Evaluation:</b>	Passing Grade: 50%, D  A minimum program GPA of 2.0 or higher where program specific standards exist is required for graduation.
<b>Other Course Evaluation &amp; Assessment Requirements:</b>	Other Course Evaluation Requirements: Smart watches, smart phones and similar devices are not allowed during tests or quizzes and must be removed.

In response to public health requirements pertaining to the COVID19 pandemic, course delivery and assessment traditionally delivered in-class, may occur remotely either in whole or in part in the 2021-2022 academic year.



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Grade  
 Definition Grade Point Equivalent  
 A+ 90 - 100% 4.00  
 A 80 - 89%  
 B 70 - 79% 3.00  
 C 60 - 69% 2.00  
 D 50 - 59% 1.00  
 F (Fail) 49% and below 0.00  
 CR (Credit) Credit for diploma requirements has been awarded.  
 S Satisfactory achievement in field /clinical placement or non-graded subject area.  
 U Unsatisfactory achievement in field/clinical placement or non-graded subject area.  
 X A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course.  
 NR Grade not reported to Registrar's office.  
 W Student has withdrawn from the course without academic penalty.

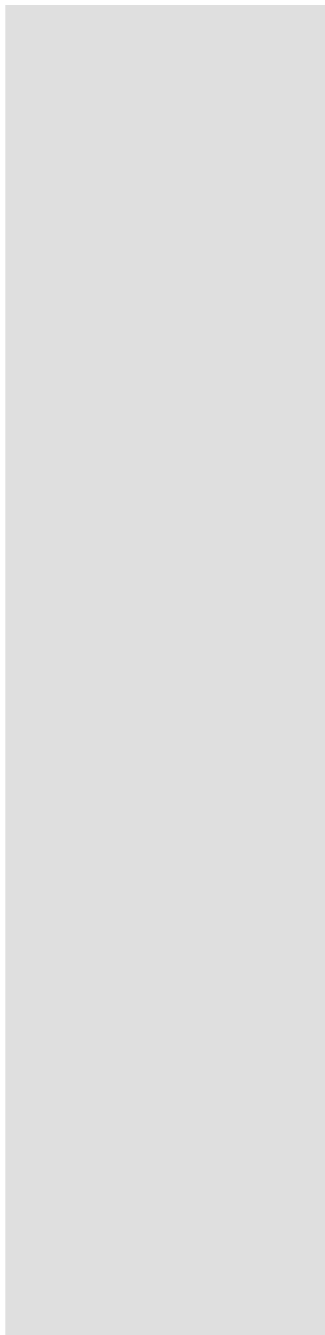
**Books and Required Resources:**

Technology Of Machine Tools by Steve F. Krar, Arthur R. Gill, Peter Smid, Robert J. Gerritsen  
 Publisher: McGraw - Hill Edition: 8  
 ISBN: 9781260565782

**Course Outcomes and Learning Objectives:**

<b>Course Outcome 1</b>	<b>Learning Objectives for Course Outcome 1</b>
1. Describe safe working procedures when setting up and operating milling machines.	1.1 Identify potential safety hazards which may occur during milling set-up and operating procedures.  Demonstrate safe working habits including: - protective clothing - protective equipment and gear - good housekeeping - start up and shut off procedures - securing and stabilizing of workpiece - lock out procedures - use of lifting devices
<b>Course Outcome 2</b>	<b>Learning Objectives for Course Outcome 2</b>
2. Identify milling attachments used for complex milling operations. (3 hrs)	2.1 Identify attachments used for complex milling operations: - slotting head - right angle attachment - vertical/horizontal attachment - high speed attachment - boring/facing heads - swivel attachments - dividing heads
<b>Course Outcome 3</b>	<b>Learning Objectives for Course Outcome 3</b>
3. Develop a plan for complex milling operations. (2 hrs)	3.1 Interpret engineering drawings, CAD data, or process sheets to determine: - workpiece material - number of workpieces - form and shape of workpiece - machining operations

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	<ul style="list-style-type: none"><li>- tolerances</li><li>- surface finish</li><li>- machining sequences</li></ul> <p>Identify complex milling techniques:</p> <ul style="list-style-type: none"><li>- gear cutting</li><li>- helical milling</li><li>- line boring</li><li>- back boring</li><li>- cam milling (CNC application)</li></ul> <p>Identify workholding devices by determining:</p> <ul style="list-style-type: none"><li>- application</li><li>- operating principles</li><li>- graduation values</li><li>- angular and rotation settings</li><li>- workpiece characteristics</li><li>- positioning, mounting and securing procedures</li><li>- discrimination</li></ul> <p>Identify required cutting tools, tool holding devices, and accessories by determining:</p> <ul style="list-style-type: none"><li>- type and application</li><li>- clearances</li><li>- tolerances</li><li>- surface finish</li><li>- machining operations and sequences</li><li>- cutting fluid requirements</li><li>- operating principles</li><li>- toolholding and support requirements</li><li>- speed and feed values</li><li>- workpiece characteristics</li><li>- handling, storing, and maintenance procedures</li></ul> <p>Describe measuring and checking procedures.</p>
<b>Course Outcome 4</b>	<b>Learning Objectives for Course Outcome 4</b>
4. Describe procedures for using mill workholding devices and accessories. (3 hrs)	<p>4.1 Identify mill workholding devices:</p> <ul style="list-style-type: none"><li>- dividing head</li><li>- mandrels</li><li>- rotary table</li></ul> <p>Describe workholding device set-up procedures by determining:</p> <ul style="list-style-type: none"><li>- application</li><li>- operating principles</li><li>- type</li><li>- size</li><li>- function</li><li>- tool selection</li><li>- type of tool</li><li>- workpiece features</li><li>- holding characteristics</li></ul>

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	<ul style="list-style-type: none"> <li>- mounting characteristics</li> <li>- location accessibility</li> <li>- workpiece characteristics</li> <li>- handling procedures</li> <li>- storing procedures</li> <li>- maintenance procedures</li> </ul> <p>Describe contact surface cleaning procedures.</p> <p>Demonstrate mounting, positioning, aligning, and securing procedures.</p>
<b>Course Outcome 5</b>	<b>Learning Objectives for Course Outcome 5</b>
5. Describe the assembly of cutting tools and holders for complex milling operations. (2 hrs)	<p>5.1 Identify cutting tool geometry (nomenclature).</p> <p>Describe milling cutting tools and tool holders:</p> <ul style="list-style-type: none"> <li>- gear cutters</li> <li>- solid carbide</li> <li>- boring tools</li> <li>- boring and facing heads</li> </ul> <p>Describe required cutting tools and tool holders by determining:</p> <ul style="list-style-type: none"> <li>- type and size</li> <li>- cutting tool material</li> <li>- shape</li> <li>- application</li> <li>- holding/mounting characteristics</li> <li>- cutting and shaping characteristics</li> <li>- tolerances</li> <li>- surface finish</li> </ul> <p>Demonstrate the assembly of cutting tools and holders.</p>
<b>Course Outcome 6</b>	<b>Learning Objectives for Course Outcome 6</b>
6. Demonstrate complex milling operations. (31 hrs)	<p>6.1 Describe helical milling techniques.</p> <p>Describe cam milling techniques.</p> <p>Demonstrate the milling of complex geometric shapes.</p>
<b>Course Outcome 7</b>	<b>Learning Objectives for Course Outcome 7</b>
7. Perform routine maintenance. (1 hr)	<p>7.1 Describe routine maintenance and cleaning procedures.</p> <p>Describe lubrication procedures.</p> <p>Describe dismantling, handling, and storage of tools, tooling, workholding devices, and measuring equipment.</p>

**Evaluation Process and Grading System:**

Evaluation Type	Evaluation Weight
Attendance, Participation and Attitude	5%
Final Test and Practical Project	50%

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	Mid term	25%
	Quiz 1	10%
	Quiz 2	10%

**Date:** August 13, 2021

**Addendum:** Please refer to the course outline addendum on the Learning Management System for further information.

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