COURSE OUTLINE: AMF204 - C.N.C. MACHINING II

Prepared: Peter Corbett
Approved: Corey Meunier, Chair, Technology and Skilled Trades

Course Code: Title	AMF204: COMPUTER NUMERICAL CONTROL MACHINING II
Program Number: Name	4069: AUTOMATED MANUFACT.
Department:	ROBOTICS GRADUATE CERTIFICATE
Semesters/Terms:	21W
Course Description:	This course is designed to provide students with the importance of Computer numerical control machines in a manufacturing environment. Students will combine classroom knowledge and apply what has been learned on actual CNC Milling machines. Students will work in both conversational and normal G code programming to write programs and perform edits as required. Safety in the Shop and the equipment will be strictly followed.
Total Credits:	5
Hours/Week:	5
Total Hours:	75
Prerequisites:	AMF104
Corequisites:	There are no co-requisites for this course.
Vocational Learning Outcomes (VLO's) addressed in this course: Please refer to program web page for a complete listing of program outcomes where applicable.	**4069 - AUTOMATED MANUFACT.** VLO 1 Solve automated manufacturing problems found in a typical industrial environment by applying engineering principles and decision-making strategies. VLO 3 Select and manage appropriate hardware and software for the creation of engineering designs. VLO 4 Identify and utilize manufacturing processes, rapid prototyping methods, and automation technologies to optimize product development. VLO 5 Incorporate sustainable, economic, safe and ethical approaches in the design and implementation of projects. VLO 7 Exercise professionalism, leadership, and effective communication in an industrial work setting to increase overall productivity and support a positive work environment. VLO 8 Ensure automation equipment is in compliance with established operating procedures, and occupational health and safety regulations.
Essential Employability Skills (EES) addressed in this course:	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 4 Apply a systematic approach to solve problems. 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

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	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.
	EES 11 Take responsibility for ones own actions, decisions, and consequences.
Course Evaluation:	Passing Grade: 50%, D A minimum program GPA of 2.0 or higher where program specific standards exist is required for graduation.
Other Course Evaluation & Assessment Requirements:	Smart watches, smart phones and similar devices are not allowed during tests or quizzes and must be removed. 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:	CNC Manufacturing Technology by Rick Calverly Publisher: The Goodheart-Wilcox Company Inc. Edition: First ISBN: 978-1-63563-883-7

Course Outcomes and Learning Objectives:

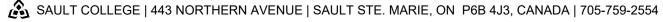| Course Outcome 1	Learning Objectives for Course Outcome 1
1. Demonstrate safe working practices in a shop atmosphere in regards to personal and machine safety including work setups.	1.1 Identify all safety items required in a shop environment. 1.2 Identify various milling machine operations and setups required and how to perform safely.
Course Outcome 2	**Learning Objectives for Course Outcome 2**
2. Explain the evolution of Computer Numerical Controlled machines.	2.1 List the various types of CNC Machines and their origins. 2.2 Identify the components of a CNC milling machine. 2.3 Understand and explain the Cartesian coordinate system and the right-hand rule for axis identification

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Course Outcome 3	Learning Objectives for Course Outcome 3
3. Explain the limitations of a CNC milling machine in regards to manufacturing.	3.1 Identify the various operations that can be performed on a CNC milling machine. 3.2 Identify work holding methods 3.3 Identify specific tools used to perform specific operations. 3.4 - Identify order of operations needed to manufacture a part.
Course Outcome 4	**Learning Objectives for Course Outcome 4**
4. Perform selection of material and determine whether ferrous or non-ferrous	4.1 Identify the materials being used. 4.2 Determine the best material selection to perform part manufacture. 4.3 Describe the characteristics of the material 4.4 Identify alternate materials that could be used and why.
Course Outcome 5	**Learning Objectives for Course Outcome 5**
5. Perform selection of cutting tools to perform various operations.	5.1 Identify the various tooling and how they are designed to cut. 5.2 Identify high speed tooling and describe why they are used. 5.3 Describe the purpose of the insert on the tool. 5.4 Identify the correct setup of the tool to perform the required operation.
Course Outcome 6	**Learning Objectives for Course Outcome 6**
6. Perform operation of the Tormach Path Pilot controller.	6.1 Perform initial startup and orientation of milling machine. 6.2 Perform basic programming functions in conversational. 6.3 Select proper tooling and orientation in the controller. 6.4 Understand tool setup in relation to axis and start points. 6.5 Perform manual movements to set tool locations. 6.6 Understand offsets and how they relate to the tool.

Evaluation Process and Grading System:

Evaluation Type	Evaluation Weight
Assignments & Labs	25%
Attendance, Attitude and Participation	10%
Lab Practical Test	20%
Written Test #1	15%
Written Test #2	15%
Written Test #3	15%

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Date:	June 11, 2020
Addendum:	Please refer to the course outline addendum on the Learning Management System for further information.

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