# Raritan Valley Community College
## Course Outline

## EMET 254 – CNC Lathe Operations

## I. Basic Course Information

    **A.** Course Number and Title: EMET254 – CNC Machining Operations

    B. New or Modified Course: New

    C. Date of Proposal: Fall 2018

    **D. Effective Term: Spring 2019**

    E. Sponsoring Departments: Science and Engineering Department

    F. Semester Credit Hours: 3

    G. Weekly Contact Hours: 6        Lecture: 3
                                          Laboratory: 3
                                          Out of Class Student Work per Week: 7.5

    H. Prerequisite: EMET253 – CNC Machining Center

    I. Laboratory Fees: Yes

    J. Name and Telephone Number or E-Mail Address of Department Chair and Divisional Dean at time of approval: Marianne Baricevic (Chair), Marianne.baricevic@raritanval.edu; Sarah Imbriglio (Dean), sarah.imbriglio@raritanval.edu

## II. Catalog Description

Prerequisite: EMET253 – CNC Machining Center

The Computer Numerical Controlled (CNC) Programming course is the fourth of four courses designed to prepare students to develop the requisite skills to become a Certified Level 1 Machinist in accordance with the National Institute for Metalworking Skills training and performance criteria (NIMS – Machining Level 1) and serves as a Technical Elective for the RVCC Mechanical Engineering Technology program. The course training includes the fundamentals of the theory, set-up, and operation of the CNC Swiss-Type and Haas mill and lathes, and Lean Manufacturing and Statistical Process Control (SPC) principles. Classes are conducted in a fully functional machine shop environment located on the RVCC Campus equipped with manual and CNC mills and lathes, virtual machining centers, precision measurement equipment, and all

basic machine shop tools.  Through this course students earn two NIMS Metalworking Skills Certifications.

Certificate 8: CNC Turning: Programming Setup & Operations

Certificate 10:  CNC Turning Operator – CNC Machining Operations


**III. Statement of Course Need**

The CNC Programming course is taken in conjunction with the other Advanced Manufacturing Courses and serves as a Technical Elective for the RVCC Mechanical Engineering Technology (MET) program. It provides the basic skills and final course of the sequence MET 151, MET 152, MET 253, necessary to prepare students to complete the following Certification:

- NIMS Machining Level I Certification


**IV. Place of Course in College Curriculum**

A. This course is a Free Elective
B. This course is a Mechanical Engineering Technology Elective
C. This course meets an elective program requirement for A.S. Mechanical Engineering Technology.
D. B.  Course transferability; for New Jersey schools go to the NJ Transfer website, [www.njtransfer.org](www.njtransfer.org). For all other colleges and universities go to their individual sites.

**V. Outline of Course Content**

A. CNC Turning: Operations
  a. Basics of the HAAS CNC Lathe
      i. Describe the general machine components of the CNC lathe and their basic functions (chucker or collets)
      ii. Understand different cutting operations
  b. Control Panel Functions for the CNC Lathe
  c. Offsets on the CNC Lathe
  d. Understand the use of handle and jog modes to move a turret or machine spindle

B. CNC Lathe: Programming Setup & Operations
  a. Coordinates for the CNC Lathe
      i. Cartesian and Polar Coordinates
      ii. Incremental vs. absolute coordinate concepts
      iii. Linear and circular interpolation
      iv. Machine zero and program zero
  b. Basics of G Code Programming
      i. Understanding different codes and what they are used for
      ii. Describe how G code programming is used to create a part program

      c.   Creating a CNC Lathe Program
      d.   Calculations for Programming the Lathe
      e.   Canned Cycles for the Lathe

# VI. General Education and Course Learning Outcomes:

## A. General Education Learning Outcomes:

At the completion of the course, students will be able to:
1. Perform calculations required for the design and machining of a mechanical part (GE-NJ 2)
2. Apply knowledge of machining and materials to machine and solve problems when machining mechanical parts (GE-NJ 2, GE-NJ 3) *

    *embedded critical thinking

## B. Course Learning Outcomes (CLO)

At the completion of the course, students will be able to:
1. Select and apply the knowledge, techniques, skills, and modern tools of the discipline to broadly defined engineering technology activities.*
2. Select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies.*
3. Create Computer Aided Design (CAD) models with Parametric CAD software.
4. Apply the principles of Lean Manufacturing and Statistical Process Control (SPC).
5. Identify basic components of the machining center as well as the devices used on this machine
6. Demonstrate the HAAS control and the features/functions
7. Demonstrate how and why parts can be successfully made on the CNC lathe or machining center
8. Determine the sequence of operations necessary to machine a part and assign toolpaths.
9. Must pass all NIMS certifications to receive college credit.
Conduct the various calculations necessary to program toolpaths on a CNC lathe or machining center for a variety of common operations.

    * This Course Learning Outcome supports the achievement of TAC of ABET Criterion 9 requirements.

# VII. Modes of Teaching and Learning

      A.  Lectures and online interactive textbooks
      B.  demonstrations

C.  laboratory work
D.  instructional videos/DVDs

## VIII. Papers, Examinations, and other Assessment Instruments

A.  laboratory performance
B.  examinations

## IX. Grade Determinants

A.  lab performance
B.  examinations
C.  class participation

## X. Text and Materials

Suggested Text: Tool-U

## XI. Resources

A.  reference books
B.  safety equipment
C.  instructional videos/DVDs