Course Name: MEC-209 Introduction to Advanced Manufacturing

Date Updated: 4/2022

Credit Hours/week: 3 hrs./wk. – 3 cr.

BEGINNING: SPRING 2022

Catalog Description: This course is a continuation in the manufacturing process using Computer Numerical Controlled (CNC) milling and turning. Students will learn about and develop advanced manual CNC programs as well as computer-assisted programs (post-processed) derived from CAD (Computer Aided Drafting) drawings. The CNC programs will focus mainly on operations involving three axis-milling machines and two axis lathes, but will also touch on operations involving advanced fixture setup and control. Topics will include spindle controls, tool changes, linear and circular interpolation, drilling and tapping, subroutines, and G&M codes. In addition, the course will cover a variety of manufacturing techniques in additive manufacturing (3D Printing), EDM (Electrical Discharge Machining), metal forming, casting, fusion welding processes, solid state welding processes and reverse engineering techniques using scanners and the CMM (Coordinate Measuring Machine).

Prerequisite: ENR 117 – Computer Aided Drafting (CAD) I, MEC 109 – Manufacturing Processes for Engineering Technology (or both MEC 117 and MEC 118)

Text: Schmid & Kalpakjian, Manufacturing Engineering & Technology, 7e, Pearson,

Supplementary Material: None

Syllabus:

Period	Topics
1	Introduction, Safety Procedures for Shop
2	Basic Milling and Lathe operations, Review of basic G&M code
3	G&M coding for CNC milling
4	G&M coding for CNC lathe
5	Additive Manufacturing (3D Printing) including post processing, welding, casting
6	QA Principles, Metrology, CMM, Comparators, and Precision Tools
7	Work holding, modular and permanent fixtures, jigs, setups
8	Midterm Exam
9	Design for Manufacturability (DFM) Principles
10	Advanced CNC – 4th and 5th axis, live tooling, high speed machining (optimization)
11	Introduction to process optimization, production optimization, layout optimization,
12	Introduction to mold design through DFM
13	Reverse Engineering, Process Validation, Final Project Introduction
14	Final Project Lab – simulation and process optimization
15	Final Project Lab – DFM, FMEA Analysis
16	Final Exam/Project Due

Students are expected to adhere to the policies of the County College of Morris. These can be accessed at: (insert link here)

Statement of Expected Course LEARNING OUTCOMES

- Identify the different types of drawings that are needed in the manufacturing environment.
- Determine the proper fixtures and jigs needed to setup parts for both operations on a mill and/or lathe
- List the manufacturing steps needed to complete the production of a part
- Explain how production optimization and machine layout optimization, are used in the manufacturing environment
- Solve the circular interpolation for turning and milling by both arc center method and the radius method
- Make use of various techniques to develop CNC program that make a “part to print”.