

# MEC-209: Introduction to Advanced Manufacturing and CNC Programming

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## New Course Proposal

**Course Type:** Credit    **Credit Type:** Institutional

**Course Prefix:** MEC    **Course Number:** 209    **Course Capacity:** 20

**General Education?** No

**Department:** Enr Science / Enr Technology (ESET)    **Division:** Business, Math., Engineering & Tech

**Course Title:** Introduction to Advanced Manufacturing and CNC Programming

**Abbreviated Course Title:** Intro to Adv Mfg & Prog

**Proposed Effective Date:** Fall 2017

**Credit Hours:**    **Lecture:** 2    **Lab:** 1    **Recitation:**    **Clinical:**    **Cooperative:**    **TOTAL:** 3

**Catalog Credits:** 3

**Course Fee:** Yes

### Catalog Course Description:

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 GM codes. In addition, the course will cover a variety of advanced manufacturing techniques in additive manufacturing (3D Printing), EDM (Electrical Discharge Machining), and reverse engineering techniques using scanners and the CMM (Coordinate Measuring Machine).

### Catalog Prerequisites:

ENR-117 and ((MEC-117 and MEC-118) or MEC-109)

### Corequisites:

**Crosslisted** No

**Textbooks:** TBD

### Supplemental Materials:

**Specialized equipment, supplies, facilities, for classes limited by enrollment or restricted by accreditation and/or equipment limitations:**  
(Information will be used to determine differential funding category.)

This course requires the use of the Prototype Lab (SH 158/SH162). Course requires the use of the appropriate powered equipment and safety equipment to support the Learning Outcomes for the course.

Enrollment limited by the equipment in the lab.

**Course Content:**

**Topics**

Review of Safety Procedures, Protocols, Basic Milling and Lathe Operations

Review of CAD/CAM (\*.dwg, \*.dxf, \*.ipt) and the integration with our CNC machinery (subtractive mfg.), Additive Manufacturing (3D printing) including part post-processing and QA

Workholding, Modular and Permanent fixtures, jigs, advance setups, Process setup and design for tolerance and speed (DFM) during repeatability

Advanced CNC operations (4th axis, possible 5th axis through simulation, live tooling, optimize for rapid production)

Introduction to process optimization, production optimization, machine layout optimization, QA, Six Sigma

Introduction to mold design with direct DFM, inc. void/shrinkage, draft/rib/insert, runners/gates, CMM as a QA process, CMM for reverse engineering

**Statement of Course Learning Outcomes:**

**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 a lathe

List the manufacturing steps needed to complete the production of a part

Describe all of the following: production optimization, machine layout optimization, and Six Sigma

Explain how production optimization, machine layout optimization, and Six Sigma, are used in the manufacturing environment

Solve the circular interpolation for turning and milling by both the arc center method and the radius method.

Make use of various techniques to develop CNC programs that make a "part to print"

**Statement of Relation to Curriculum(s):**

This course will be a required course in the Mechanical Engineering Technology Program (P3700) and also serves as an elective for the Computer Aided Drafting (CAD) Certificate, as well as an elective for other Certificates of Achievement (CoAs) offered by the department.

**Format for offering the course:**

**(check all that apply)**

Traditional

Key: 10060