COURSE OUTLINE

Machine Technology 111
Principles of Numerical Control

Catalog Statement

MACH 111 presents principles of numerical control, preparation of machining programs and development of control tapes. It is designed for the advanced machine technology student who wishes to explore the field of numerically controlled machining.

Total Lecture Units: 3.0
Total Laboratory Units: 0.0
Total Course Units: 3.0

Total Lecture Hours: 48.0
Total Laboratory Hours: 0.0
Total Laboratory Hours To Be Arranged: 0.0
Total Faculty Contact Hours: 48.0

Prerequisite: MACH 101 or equivalent (MACH 101 may be taken concurrently).
Note: This course may be taken for credit by student who have completed MACH 110.

Course Entry Expectations

Prior to enrolling in the course, the student should be able to:

- demonstrate safety practices with machinery during milling and lathe operations;
- perform a series of fundamental machining exercises in lathe and milling operations;
- use precision inspection equipment;
- demonstrate drilling, reaming, tapping and knurling procedures;
- demonstrate the setup and utilization of various lathe and milling operations and procedures.

Course Exit Standards

Upon successful completion of the required coursework, the student will be able to:

- demonstrate an understanding of advanced numerical control programming by completing a series of part programs;
- demonstrate knowledge of advanced machine operation by performing a series of individual operation on the numerical controlled milling machine;
- complete machining a complex designed part following established requirements;
- demonstrate critical thinking skills by attaining satisfactory scores on a written quizzes and examinations.

Course Content

Total Faculty Contact Hours = 48.0

General Introduction **(6 hours)**
Scope of curriculum

Course requirements
Grading standards
Methods of work preparation

Familiarization **(6 hours)**
Physical machine
Capabilities of control
Limitations of machine functions
Limitations of number of control operations

History of Numerical Control **(3 hours)**
Vacuum tube, original method of control
Transistor advanced to reduced size
Solid state replacement card simplified repair and updating
Advantage in comparison to standard machine
Disadvantages - single part production more expensive

Applications **(4 hours)**
Industries using systems for total automation of plants
Applications of controls to various machine functions

Systems of Measurement **(10 hours)**
Point to point system, straight line or single angle
Continuous path, capable of all functions including arcs
Servo mechanisms which power drive is best
Open loop system - reason for reduced cost
Closed loop system - reason for accuracy in control

Dimensioning **(6 hours)**
Cartesian coordinate system
Datum reference system - single point of reference
Delta dimensioning chain-link measurement

Machine Positioning **(8 hours)**
Absolute positioning uses point to point
Incremental positioning uses contouring system
Linear interpolation on straight line system work
Circular interpolation used on arcs and circles

Tape and Command Programming **(5 hours)**
Tape standards for machines
Coding of basic commands for tapes
Tape types, paper, paper mylar, mylar, aluminum mylar, and magnetic
Reader or tape interpreter

Methods of Instruction

The following methods of instruction may be used in this course:

- lecture/discussion;
- demonstration
- films;
- peer learning.

Out of Class Assignments

The following out of class assignments may be used in this course:

- written homework assignments;
- short essays (e.g. research a current or up and coming use for numerical control and write an essay describing what you need to learn to be proficient in this new use of numerical control).

Methods of Evaluation

The following methods of evaluation may be used in this course:

- midterm examinations;
- individual in-class projects;
- research paper;
- reading and writing assignments;
- final exam.

Textbooks

None.

Student Learning Outcomes

Upon successful completion of the required coursework, the student will be able to:

- student will understand the historical and modern applications for machines with counting programs or numerical controls;
- student will demonstrate advanced knowledge in machining through individual projects completed during lab hours;
- student will design, execute, and analyze in-class project from an educated perspective;
- student will improve machining skills with numerical accuracy though course material and laboratory practice.