Machining, Machine Tools and Cutting Tools

Course Outline and Syllabus
Course Title: Machining, Machine Tools and Cutting Tools

Instructor: TBD

Course Description: An introduction of machining processes, machine tools, cutting tools, and computer numerical control (CNC) and computer assisted manufacturing (CAM) techniques and practices. Includes the use of the Cartesian coordinate system, programming codes and command, and tooling requirements for CNC/CAM machines. This course also provides a review in technical mathematics and mechanical drawing interpretation.

Prerequisite: None

Course Length: 40 hrs.

Text: TBD

Methodology: Any and/or all of the following activities may be utilized by the instructor during the term to achieve the learning objectives for the course.

A. Lecture
B. Discussions
C. Audio/Visual Instruction
D. Individual and Group Projects/Presentations
E. Laboratory Exercises
F. Quizzes and Examinations

Course Objective:
Upon completion of this course, the student will be able to;

- understand the general types of material removal machine tools
- define general machining functions and their principles,
- defines general tooling and work holding devices,
- understand factors of machining,
- understand the Cartesian Coordinate System as it applies to 2 and 3 axis machine tools,
- calculate geometric relationships using basic trigonometric functions.

Course Outline:

I. Introduction to Machining
   A. Types of Machining Processes
   B. Overview

II. Machining Principles
   A. Machine Tools
   B. Metal Removal
   C. Milling Operation
   D. Tooling
   E. Work holding Devices
   F. Lathe Operation
   G. Tooling
   H. Work holding devices

III. Machining Factors
   A. Speeds
   B. Feeds
   C. Depth of Cuts

IV. Lubricants and Coolants
   A. Uses
   B. Types

V. Cartesian Coordinate System
   A. Mill axes system
   B. Absolute
   C. Incremental
D. Lathe axes system
E. Absolute
F. Incremental
G. Application

VI. CNC Controller
A. Elements
B. Modes

VII. Basic Trigonometry

VIII. Review of Technical Drawings

Student Learning Objectives: (Competences)

1. Describe CNC machining and uses, and applications of CNC program.
   - Describe different methods of metal removal
   - Describe the capabilities and limitations of computer numerical control (CNC)/computer assisted manufacturing (CAM) equipment.
   - Describe the general machining operations performed on CNC machine tools.
   - Describe the type of cutting tools used on CNC machine tools.
   - Describe the materials used to manufacture cutting tools.
   - Understand and utilize to calculate machining factors such as speeds, feeds, and depth of cuts.
   - Describe the importance of coolants and lubricants in the machining operation.
   - Describe the different types of coolant solutions used in machining.
   - Understand basic G, M codes
   - Describe the Cartesian coordinate system as used in a CNC machine program.
   - Calculate the coordinates position of geometric points of transition on and X and Y system.
   - Calculate the coordinates position of geometric points of transition on and X and
Z system.

- Describe the differences in absolute and incremental dimensioning as related to an ISO programming of a CNC machine.
- Review a mechanical drawing and determine the appropriate datum structure.
- Perform calculations to determine coordinates utilizing Trigonometric equations.
- Understand the elements of a CNC machine tool controller.
- Describe procedures for CNC machine start-up.
- Explain safety requirements.

**Grades:** Grades for this course will follow the following criteria.

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<tbody>
<tr>
<td>Tests</td>
<td>40%</td>
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<td>Lab Activities</td>
<td>40%</td>
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<tr>
<td>Final</td>
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**Attendance Policy Statement**

All students are expected to attend each class. Students are solely responsible for keeping up with their attendance.

If circumstances require an absence, then students should note that it may initiate starting the course from where the absence occurred when the course is presented again. Each case will be treated to ensure that the student receive the full benefit of the training.

**If Machine Tools are Used**

**Safety Test:** Each student enrolled in the CNC Fundamental Course must successfully pass a safety test. This test is based on knowledge and skills needed to safely perform duties and responsibilities within the chosen field of study. A score of 100% must be obtained before students will be allowed to perform and lab activities.

**Classroom Safety/Security:** All students are expected to be familiar with emergency evacuation procedures, emergency medical procedures, and potential classroom hazards. Your instructor should review these procedures at the beginning of the semester, either orally or in writing. Please ask for clarification if your instructor fails to adequately review these procedures.
Student Responsibilities:

Students are expected to be responsible for their actions as they relate to in-class activities.

As a student, you are expected to:

- Arrive to the class/laboratory on time and enter with respect for others
- Remain attentive in class
- Prepare for each class. This means preparation of assignments as well as preparation for participation.
- Attend all classes (legitimate excuses are understood). (Letting the instructor know of the absence prior to class is good business on the part of the student.)
- Refrain from non-topic, side conversation.
- Be prompt on meeting scheduled times (class time, due date of reports, etc.)
- Work with others as assigned to complete an assignment carrying out his or her portion of the assignment to its fullest.
- Be respectful to the instructor and the other students.

Essential Functions:

1. Wear safety glasses at all times when in machine tool lab.
2. Wear proper protective equipment when performing lab activities.
3. Use small hand tools.
4. Use machinery in shop.
5. Use measuring instruments.
6. Read and understand technical literature.
7. Read and understand blueprints.
8. Reason and perform problem solving activities.
9. Work with others and communicate orally and in writing.
10. Exhibit behavior and social skills that is acceptable to the college.

The above list of essentials functions is not intended as a complete list.