Western Technical College

10420120 Manufacturing Processes/Machining CAM (Computer Aided Manufacturing)

Course Outcome Summary

Course Information

Description
This course examines primary and secondary manufacturing processes. You will use the tools of traditional material removal processes by "making a part." You will also study forming, casting, and other manufacturing techniques and their applications. Final assembly and finishing are examined. You will be required to visit manufacturing facilities to observe the day-to-day operations of modern manufacturing. The student will learn a computer aided manufacturing (CAM) software. They will model a part and then take the part into the CAM software and machine the part using the CNC machine.

Career Cluster
Manufacturing

Instructional Level
Associate Degree Courses

Total Credits
3.00

Textbooks


Learner Supplies


Course Competencies

1. Document the significant events in the history of manufacturing.

   Assessment Strategies
   1.1. in the completion of all learning activities
   1.2. in a course portfolio

   Learning Objectives
   1.a. Describe the history of modern manufacturing.
   1.b. Explain the three most significant manufacturing developments of the Industrial Revolution that
characterize the production of products today.
1.c. Differentiate the production of goods before and after the Industrial Revolution.
1.d. Summarize the changes and innovations in machine tool design since the Industrial Revolution.

2. Classify contemporary manufacturing systems.

Assessment Strategies
2.1. in the completion of all learning activities
2.2. in a course portfolio
2.3. in a site visit to a manufacturing facility

Learning Objectives
2.a. Describe the SIC/NAICS code system for manufacturing.
2.b. Differentiate process and discreet manufacturing.
2.c. Describe the benefits of applying group technology principles to design and manufacturing.
2.d. Identify the components of a Flexible Manufacturing System.
2.e. Describe the characteristics of a just-in-time system.
2.f. Discuss the working of a Kanban or Pull System of production.

3. Determine the traditional material removal machine tools and operations necessary to generate specific geometric shapes.

Assessment Strategies
3.1. completion of all learning activities
3.2. in a course portfolio
3.3. on a written exam
3.4. making a part in the machine shop
3.5. in a summary of a site visit to a machine shop

Learning Objectives
3.a. Describe the principles of machining and material removal (chip making).
3.b. Identify material removal processes necessary to generate specific shapes.
3.c. Distinguish how material is removed in terms of the relative motion of the tool and the workpiece.
3.d. Identify basic machine tools and their component parts.
3.e. Describe workholding devices used for different machine tools.
3.f. Examine some typical tooling used for material removal.
3.g. List the advantages and limitations of each material removal process identified.
3.h. Determine expected tolerance, surface finish, and relative cost for traditional material removal processes.
3.i. Use the band saw, lathe, milling machines, and drill press to perform material removal processes.
3.j. Derive a CNC cutting program from a CAD solid model.

4. Analyze feeds and speeds for traditional material removal processes.

Assessment Strategies
4.1. in completion of all learning activities
4.2. in a course portfolio
4.3. on a written exam

Learning Objectives
4.a. List the dependent and independent variables that affect machinability.
4.b. Define the following terms:  feed, cutting speed, depth of cut, material removal rate, machinability.
4.c. Describe how “chips” are made.
4.d. Use standard tables to select appropriate speeds for a specific part material/cutting process combination.
4.e. Compare costs of machining specific geometry using different processes.
4.f. Calculate machine tool settings, material removal rates, and horsepower requirements.
4.g. List the machining factors that have the greatest impact on surface finish, tool life, and material removal rate.

5. Evaluate the applications of joining techniques.

Assessment Strategies
5.1. in a written exam
5.2. in a course portfolio
5.3. in the completion of all learning activities

Learning Objectives
5.a. Identify common methods of joining materials.
5.b. Categorize joining by the different methods used, material to be joined, and strength of the joint.
5.c. Discuss the advantages and disadvantages of different joining techniques.
5.d. Identify different techniques for joining metals and nonmetals.
5.e. Differentiate the different fusion welding process according to type of electrode, power supply, shielding gas, welding positions, metals, advantages, and limitations.
5.f. Use the American Welding Society classification system for joining of metals.
5.g. Explain the differences between fusion, resistance, and solid state welding.
5.h. Differentiate welding, brazing, and soldering.
5.i. Describe applications, advantages, and limitations of brazing and soldering.
5.j. Discuss the use of adhesives as a bonding mechanism.
5.k. Identify and explain mechanical fastening applications.

6. Create geometry using CAM software

Assessment Strategies
6.1. In the classroom, lab, or shop setting
6.2. Using computer software
6.3. In applied assignments
6.4. Individually
6.5. On tests and quizzes
6.6. Given prints, files, tutorials, and course reference materials

Learning Objectives
6.a. Utilize geometry toolbar fly-out menus
6.b. Create lines using CAM software
6.c. Create circles using CAM software
6.d. Create fillets using CAM software
6.e. Create arcs using CAM software
6.f. Create dimensions using CAM software
6.g. Trim and extend geometry using CAM software
6.h. Utilize the snap mode toolbar
6.i. Reproduce prints using CAM geometry tools

7. Modify geometry using CAM software

Assessment Strategies
7.1. In the classroom, lab, or shop setting
7.2. Using computer software
7.3. In applied assignments
7.4. Individually
7.5. On tests and quizzes
7.6. Given prints, tutorials, files, and course reference materials

Learning Objectives
7.a. Utilize the transform function in CAM program
7.b. Translate geometry using CAM software
7.c. Rotate geometry using CAM software
7.d. Scale geometry using CAM software
7.e. Reflect geometry using CAM software

8. Chain boundary curves using CAM software

Assessment Strategies
8.1. In the classroom, lab, or shop setting
8.2. Using computer software
8.3. In applied assignments
8.4. Individually
8.5. On tests and quizzes
8.6. Given prints, tutorials, files, and course reference materials
Learning Objectives
8.a. Define the term curve as it relates to a machining boundary
8.b. Describe the types of geometry that require boundaries for machining
8.c. Chain closed boundaries
8.d. Chain open boundaries
8.e. Create curves using the curve wizard
8.f. Chain boundaries that cross other boundaries
8.g. Name boundary curves
8.h. Locate curves in the step toolbox
8.i. Locate curves in the part view toolbox

9. Select appropriate post processor and generate NC code

Assessment Strategies
9.1. In the classroom, lab, or shop setting
9.2. Using computer software
9.3. In applied assignments
9.4. Individually
9.5. On tests and quizzes
9.6. Given prints, tutorials, files, and course reference materials

Learning Objectives
9.a. Locate post processor options
9.b. Select the required post processor
9.c. Generate NC code
9.d. Save NC code
9.e. Open and view NC code
9.f. Edit NC code text file

10. Prove-out CAM programs in CNC machine tools

Assessment Strategies
10.1. In the classroom, lab, or shop setting
10.2. Using computer software and actual CNC machine tools
10.3. In applied assignments
10.4. Individually and in groups
10.5. On tests and quizzes
10.6. Given prints, stock, process sheets, diagrams, materials, and all available shop equipment and supplies

Learning Objectives
10.a. Adhere to machine shop safety procedures
10.b. Adhere to CNC machine tool safe operating procedures
10.c. Prove-out CAM milling programs in CNC machining centers
10.d. Prove-out CAM turning programs in CNC turning centers
10.e. Complete CNC/CAM process sheets