MET-1240: MACHINE TOOLS AND MANUFACTURING PROCESSES

Cuyahoga Community College

VIEWING: MET-1240: MACHINE TOOLS AND MANUFACTURING PROCESSES

Board of Trustees:
2016-01-28

Academic Term:
Spring 2019

Subject Code
MET - Mech Eng/Manuf Ind Eng Tech

Course Number:
1240

Title:
Machine Tools and Manufacturing Processes

Catalog Description:
Application of traditional and contemporary machine tools processes to accomplish the mechanical parts production or the maintenance and/or repairs of mechanical parts or equipment. Laboratory experiences include measuring and inspection, layout and fundamentals of machine tool setup and techniques for drilling, turning, milling and grinding. Manufacturing processes including the production of metals and alloys, polymers and plastics, forming, machining, fabrication, conditioning and finishing of metallic, plastic and composite engineering parts.

Credit Hour(s):
3

Lecture Hour(s):
2

Lab Hour(s):
3

Requisites

Prerequisite and Corequisite
MATH-0955 Beginning Algebra or appropriate math placement score to place into MATH-0965 Intermediate Algebra.

I. ACADEMIC CREDIT

Academic Credit According to the Ohio Department of Higher Education, one (1) semester hour of college credit will be awarded for each lecture hour. Students will be expected to work on out-of-class assignments on a regular basis which, over the length of the course, would normally average two hours of out-of-class study for each hour of formal class activity. For laboratory hours, one (1) credit shall be awarded for a minimum of three laboratory hours in a standard week for which little or no out-of-class study is required since three hours will be in the lab (i.e. Laboratory 03 hours). Whereas, one (1) credit shall be awarded for a minimum of two laboratory hours in a standard week, if supplemented by out-of-class assignments which would normally average one hour of out-of-class study preparing for or following up the laboratory experience (i.e. Laboratory 02 hours). Credit is also awarded for other hours such as directed practice, practicum, cooperative work experience, and field experience. The number of hours required to receive credit is listed under Other Hours on the syllabus. The number of credit hours for lecture, lab and other hours are listed at the beginning of the syllabus. Make sure you can prioritize your time accordingly. Proper planning, prioritization and dedication will enhance your success in this course.

The standard expectation for an online course is that you will spend 3 hours per week for each credit hour.

II. ACCESSIBILITY STATEMENT

If you need any special course adaptations or accommodations because of a documented disability, please notify your instructor within a reasonable length of time, preferably the first week of the term with formal notice of that need (i.e. an official letter from the Student Accessibility Services (SAS) office). Accommodations will not be made retroactively.
For specific information pertaining to ADA accommodation, please contact your campus SAS office or visit online at http://www.tri-c.edu/accessprograms/. Blackboard accessibility information is available at http://access.blackboard.com.

III. ATTENDANCE TRACKING

Regular class attendance is expected. Tri-C is required by law to verify the enrollment of students who participate in federal Title IV student aid programs and/or who receive educational benefits through other funding sources. Eligibility for federal student financial aid is based in part on enrollment status.

Students who do not attend classes for the entire term are required to withdraw from the course(s). Additionally, students who withdraw from a course or stop attending class without officially withdrawing may be required to return all or a portion of their financial aid based on the date of last attendance. Students who do not attend the full session are responsible for withdrawing from the course(s).

Tri-C is responsible for identifying students who have not attended a course before financial aid funds can be applied to students’ accounts.

Therefore, attendance is recorded in the following ways:

• For in-person and blended-learning courses, students are required to attend the course by the 15th day of the semester (or equivalent for terms shorter than five weeks) to be considered attending. Students who have not met all attendance requirements for in-person and blended courses, as described herein, within the first two weeks or equivalent, will be considered not attending.
• For online courses, students are required to login at least two times per week and submit one assignment per week for the first two weeks of the semester, or equivalent to the 15th day of the term. Students who have not met all attendance requirements for online courses, as described herein, within the first two weeks or equivalent, will be considered not attending.

At the conclusion of the first two weeks of a semester or equivalent, instructors report any registered students who have “Never Attended” a course. Those students will be administratively withdrawn from that course. However, after the time period in the previous paragraphs, if a student stops attending a class or wants or needs to withdraw, for any reason, it is the student’s responsibility to take action to withdraw from the course. Students must complete and submit the appropriate Tri-C form by the established withdrawal deadline.

Tri-C is required to ensure that students receive financial aid only for courses that they attend and complete. Students reported for not attending at least one of their registered courses will have all financial aid funds held until confirmation of attendance in registered courses has been verified. Students who fail to complete at least one course may be required to repay all or a portion of their federal financial aid funds and may be ineligible to receive future federal financial aid awards. Students who withdraw from classes prior to completing more than 60 percent of their enrolled class time may be subject to the required federal refund policy.

If illness or emergency should necessitate a brief absence from class, students should confer with instructors upon their return. Students having problems with coursework due to a prolonged absence should confer with the instructor or a counselor.

IV. LEARNING OUTCOMES ASSESSMENT

Occasionally, in addition to submitting assignments to their instructors for evaluation and a grade, students will also be asked to submit completed assignments, called ‘artifacts,’ for assessment of course and program outcomes and the College’s Essential Learning Outcomes (ELOs). The artifacts will be submitted in Blackboard or a similar technology. The level of mastery of the outcome demonstrated by the artifact DOES NOT affect the student’s grade or academic record in any way. However, some instructors require that students submit their artifact before receiving their final grade. Some artifacts will be randomly selected for assessment, which will help determine improvements and support needed to further student success. If you have any questions, please feel free to speak with your instructor or contact the Learning Outcomes Assessment office.

V. CONCEALED CARRY STATEMENT

College policy prohibits the possession of weapons on college property by students, faculty and staff, unless specifically approved in advance as a job-related requirement (i.e., Tri-C campus police officers) or, in accordance with Ohio law, secured in a parked vehicle in a designated parking area only by an individual in possession of a valid conceal carry permit.

As a Tri-C student, your behavior on campus must comply with the student code of conduct which is available on page 29 within the Tri-C student handbook, available at http://www.tri-c.edu/student-resources/documents/studenthandbook.pdf. You must also comply with the College’s Zero Tolerance for Violence on College Property available at http://www.tri-c.edu/policies-and-procedures/documents/3354-1-20-10-zero-tolerance-for-violence-policy.pdf.

Outcomes
Course Outcome(s):
Apply the principles of machine tool and correctly use machine tools to produce engineering parts.
Objective(s):
1. Follow safety precautions in the use of machine tools and demonstrate safe behavior on the shop floor.
2. Read measuring and inspection tools used in the machine shop.
3. Layout parts using steel rule, vernier high gage and gage block, micrometers, calipers, divider, center-punches and scribers.

Course Outcome(s):
Properly set up and operate drilling machines to accurately make holes in on a work piece.

Objective(s):
1. Select a setup a drilling machine.
2. Select desired size drill bits, center drill, and tap drill size, and taps.
3. Select proper drill speed for drilling, reaming, counter-boring and counter-sinking.
4. Drill holes, ream holes, tap holes, counter-sink and counter-bore holes.
5. Check holes for dimensional and geometrical accuracy and consistency.

Course Outcome(s):
Properly set up and operate the Lathe to accurately produce basic mechanical parts.

Objective(s):
1. Recognize work pieces that can be produced on the lathe.
2. Identify lathe parts and their functions.
3. Demonstrate a proper work piece set-up on the lathe.
4. Demonstrate a proper tool set-up on the lathe.
5. Select lathe operations parameters: speed, feed and appropriate depth of cuts.
6. Describe turning between centers and appropriate application.
7. Turn taper or conical surfaces on the lathe.
8. Produce threads on the lathe.
9. Discuss principles of lathe operation.

Course Outcome(s):
Properly set up and operate Milling machines to accurately produce basic mechanical parts.

Objective(s):
1. Describe Milling machines and milling operations.
2. Recognize work pieces that can be produced on the Milling.
3. Identify milling machines' parts and their functions.
4. Describe different types of milling machines.
5. Demonstrate the knowledge of tools, their application and proper tool set-up on the milling machine.
6. Select milling operations parameters: speed, feed and appropriate depth of cuts.
7. Produce an assigned work piece on the milling machine.

Course Outcome(s):
Properly set up and use power saws to cut materials on a shop floor.

Objective(s):
1. Identify power different types of power saw
Course Outcome(s):
Apply knowledge of manufacturing principles.

Objective(s):
1. Explain the relationship between process, design, and material in manufacturing.
2. Use the Taxonomy of Manufacturing Processes to locate and describe manufacturing processes.
3. Analyze product features to identify manufacturing processes that may have been used.
4. Describe examples of how different manufacturing processes can be used to produce the same product.
5. Suggest manufacturing processes required to make a product design from an engineering drawing and explain why the recommended suggestions were made.

Course Outcome(s):
Apply knowledge of the process of Metal Forming and Joining.

Objective(s):
1. a. Describe each of the following processes—welding, casting, forming, and forging—including work piece materials, consumable materials, safety procedures, necessary equipment, and manufacturing applications.
2. b. Differentiate between various processes within the categories of welding, casting, forming and forging, and identify which process would be most applicable and cost-effective for a given product.
3. c. Describe and interpret manufacturing process data (including materials, machines, and process parameters) in reference manuals.
4. d. Explain the proper procedures for the operation of basic sheet metal forming machines such as a box and pan brake, shear, and piercing and blanking machines.
5. e. Explain the proper procedures to operate at least one basic welding machine such as gas metal arc welding, gas tungsten arc welding, shielded metal arc welding, covered metal arc welding, or oxygen acetylene cutting.
6. f. Explain proper procedures for green-sand casting of parts.

Course Outcome(s):
Apply knowledge of plastics and composite material processing.

Objective(s):
1. A. Define terms related to plastics and plastics processes.
2. B. Explain each of the following processes: injection molding, extrusion, blow molding, rotational molding, and thermoforming.
3. C. Identify process selection considerations and limitations, including design, volume, dimensions, tolerances, and cost.
4. D. Describe the physical method of processing and the machinery and tooling used for each of the following processes: injection molding, extrusion, blow molding, rotational molding, and thermoforming.
5. E. Identify process variables (including time, temperature, and pressure) which may affect product quality and how these variables affect the mechanical properties of materials during processing.
6. F. Identify the process used to make a plastics product.
7. G. Use reference materials (such as Material Safety Data Sheets and Modern Plastics encyclopedia) to locate relevant information about plastics processes and materials.

Methods of Evaluation:
1. Inspection and grading of projects
2. Quizzes and assignments
3. Midterm examination
4. Final examination

Course Content Outline:
1. CONCEPTS
   a. Material forming processes
   b. Extrusion process
   c. Wire drawing process
   d. Sheet metal shearing process
   e. Bending process
f. Stretching process
g. Drawing process
h. Material removal processes
i. Cutting tools operation
j. Machine tools operation and maintenance
k. Layout techniques
l. Prints interpretation techniques
m. Measuring techniques
n. Inspection techniques
o. Traditional manufacturing principles and processes
p. Contemporary manufacturing principles and processes
q. Metal casting processes, design and applications
r. Metal Manufacturing Process
s. Plastic Manufacturing Process
t. Composite manufacturing process
u. Plastic materials processing
v. Composite materials processing
w. Lathe operation principles
x. Drilling machine operation principles
y. Milling machine operation principles
z. Grinding machine operation principles
aa. Power saw operation principles
bb. Safety precautions
cc. Safe shop floor behavior
dd. Taxonomy of Manufacturing processes
ee. Material Safety Data Sheets
ff. Modern Plastics Encyclopedia
gg. Green-sand casting procedures

2. SKILLS
   a. Operate lathes to produce parts
   b. Operate milling machines to produce parts
   c. Operate drill presses to produce parts
   d. Select manufacturing processes to accomplish production of given parts
   e. Select processes to accomplish the maintenance or repair of defective equipment or machines parts.
   f. Measure and inspect parts for geometrical and dimension accuracy
   g. Select and set up tools on machine tools
   h. Calculate speed and feeds
   i. Operate grinding machines to produce parts.
   j. Select and interpret shop detail drawings.
   k. Select proper PPE for the operation.
   l. Set up a mill vise operation.
   m. Perform drilling operations using a drill press.
   n. Lay-out and fabricate a selected project to specified tolerances.
   o. Read, and record angular measurements using the correct instruments.

3. ISSUES
   a. Safe operations and maintenance of machine tools
   b. Safe handling of hand tools
   c. Applying maintenance concepts in problems resolution

---

**Resources**


Falcioni, John, ed. *Mechanical engineering : The Journal of the American Society of Mechanical Engineers*. (ts '2007-10-01 00:00:00').

**Resources Other**

1. Handouts
2. Assignments supplied by the Instructor
3. Videos
4. Internet

**Instructional Services**

**OAN Number:**

OET010

**CTAN Number:**

CTMET004

Top of page

Key: 2885