ATMT-2420: ADVANCED PRECISION MACHINING

Cuyahoga Community College

Viewing: ATMT-2420 : Advanced Precision Machining

Board of Trustees:
1999-07-22

Academic Term:
Spring 2019

Subject Code
ATMT - Appd Ind Tech-ManufacturingTec

Course Number:
2420

Title:
Advanced Precision Machining

Catalog Description:
Advanced study of relationship of materials, fixtures, and special machining operations as they relate to applications of machine shop production of precise parts, dies, and mold components. Provides theory on use of machining exotic materials, hard turning, machining of plastics, fourth and fifth axis programming, coolants and specialty inserts. Includes practical applications and machine shop mathematics formulas used in fixture and holding device design. Provides knowledge of castings, weldments, tool coatings and manufacturing methods that are becoming part of today’s technology such as waterjets and lasers. Covers advanced metallurgy processes, and standard procedures for troubleshooting all types of manufacturing projects.

Credit Hour(s):
2

Lecture Hour(s):
2

Requisites
Prerequisite and Corequisite
ATMT-2500 Manufacturing Technology Skills II, and departmental approval.

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 https://www.tri-c.edu/student-accessibility-services/. Blackboard accessibility information is available at http://access.blackboard.com.

Eastern (216) 987-2052 - Voice. (216) 987-2423 - Fax
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 repay 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. 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.

Students are responsible for adhering to all College health and safety guidance, including that which relates to the COVID-19 pandemic. Public health requirements and standards are changing rapidly, and the College is adapting its guidance accordingly. Please check your Tri-C email and visit tri-c.edu/coronavirus regularly for updates. All students must adhere to the following general guidelines, until further notice:
• Remain at home if you are ill or experiencing symptoms of illness. Do not attend any in-person class or gathering.
• Notify your instructor(s) if you are ill, have tested positive for COVID-19, or were exposed to an individual who has tested positive for COVID-19 and they will report the information to the Tri-C Compliance & Risk Management team and you may be contacted for follow-up information.
• Wear a mask or face covering at all times, including, but not limited to: upon entering and exiting any Tri-C facility, in class, and in all common areas.
• Maintain a distance of at least six feet between yourself and others at all times and if you must pass near an individual do it quickly and do not linger.
• Provide the College with relevant information about your current health status and participate in any required on-site checks (e.g., temperature checks, current contact information, symptom profile, etc.).
• Use only designated areas of Tri-C facilities, including entrances and exits. Sign in and out of Tri-C facilities as directed.

The general guidelines listed above do not encompass all coronavirus-related guidance. These guidelines are subject to change at the discretion of the College and under the direction of public health authorities. Students who fail to adhere to this guidance may be subject to disciplinary action under the College’s Student Code of Conduct and the Student Judicial Code.

Outcomes

Course Outcome(s):

N/A

Objective(s):

1. Discuss advanced fixture design concepts.
2. Provide a practical knowledge of production fixtures and planning methods.
3. Apply cutter geometry for manufactured parts.
4. Demonstrate simple 4th and 5th axis programming, and programmable indexers.
5. Discuss coolants and lubricants, advanced metallurgy and processing.
6. Demonstrate use of lasers and waterjets.
7. Demonstrate hard turning of materials, and machining exotic metals.
8. Demonstrate use of tool coatings to maximize tool life.
9. Explain machining tables and their use in regards to reference, how to locate them, and where.

Methods of Evaluation:

1. Class assignments
2. Quizzes
3. Classroom participation
4. Exams

Course Content Outline:

1. Workholding devices
   a. Types
   b. Methods
   c. Specialty
   d. Standard parts
   e. Basic design
   f. Weight and practicality
   g. Modular workholding devices
2. Fixture design
   a. Weight and use
   b. Purchased standard parts
   c. Production principles
   d. Sketching
3. Production fixtures and planning methods
   a. When is it practical to build a fixture
   b. Procedures
   c. Production principles (short run / long run)
   d. Job flow
   e. Safety factors (pinch points)
   f. Production
   g. Fixture calculations using mathematical formulas
4. Tool geometry
   a. Positive / negative tools
   b. Chip breaker types
   c. Taps
   d. Corner radii
   e. Tool design to maximize production
   f. Spiral points
   g. Forming taps
   h. Indexable insert materials

5. 4th and 5th axis programming
   a. Primary
   b. Secondary
   c. Tertiary
   d. Coordinate systems
   e. Cartesian
   f. Polar
   g. Incremental
   h. Absolute
   i. Work reference

6. Programmable indexers
   a. I/O capacity
   b. Limit switches
   c. Interlocks
   d. Interface
   e. Standard features
   f. Servo drives

7. Coolants and lubricants
   a. Mist type
   b. Flood type
   c. Water soluble
   d. Synthetic
   e. Petroleum based
   f. High pressure coolant pumps

8. Lasers / waterjets
   a. Systems
   b. Types
   c. Manufacturing needs

9. Hard turning of materials
   a. Tooling
      i. CBN
      ii. ceramics
      iii. inserts
   b. Coolants
   c. Processes

10. Machining exotic metals
    a. Tooling
    b. Surface speeds and feeds
    c. Coolants
    d. Safety

11. Tool coatings to maximize tool life.
    a. Oxides
    b. Chrome / chrome conversion
    c. Nitride
    d. Aluminum oxide
    e. Other types

12. Machining tables
a. Speeds
b. Feeds
c. Reference

13. Castings and weldments
   a. Stress relieving
   b. Fixturing
   c. Layouts / inspections
   d. Repair
   e. Machining procedures
   f. Normalizing

14. Threading
   a. Rolling
   b. Forming
   c. Pipe
   d. English
   e. Buttress
   f. Advanced thread type
   g. Inspection

15. Grinding
   a. Thread
   b. ID / OD
   c. Surface
   d. Blanchard
   e. Jig
   f. Double disk

Resources


Childs, James. 'Principals of Numerical Controls'