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.

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

Holbrook, Horton. *Machinery's Handbook.* Industrial Press, 1998.

Lin, Jonathan. *Computer Numerical Control.* Albany, New York: Delmar Publications, 1997.

Childs, James. "Principals of Numerical Controls"

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