

CNC Operations

Course Outcome Summary

Updated November 2022

Course Information

Total Credits 3

Description

Students will become acquainted with the history of Numerical Control (NC) and Computer Numerical Control (CNC) machines and will be introduced to a CNC machine used in the precision machining trades. They will gain practical experience in the application of "G" codes and "M" codes, writing CNC machine programs, and machine setup and operation.

Prerequisites

OSHA 10 or 30 Safety Course

Machining I

Machining II

Exit Learning Outcomes

Program Outcomes

- A. Operate machine tool equipment commonly found in industry including CNC Turning Centers, and CNC Vertical and Horizontal Machining Centers.
- B. Manufacture parts from various materials in accordance with specifications from blueprints, electronic drawings, and shop sketches
- C. Solve quality problems using process planning, technical knowledge, teamwork, mathematics, and critical thinking
- D. Apply safety principles in a work environment to minimize hazards and prevent losses to productivity
- E. Demonstrate employability skills needed to obtain and retain employment in machine tool and related fields
- F. Use CAD and CAM programs to design parts and program CNC machines

Competencies

1. Conduct job hazard analysis for CNC lathe and mill

Properties

Domain: Cognitive Level: Application

Linked Program Outcomes

Apply safety principles in a work environment to minimize hazards and prevent losses to productivity

2. Create handwritten CNC programs using G and M codes

Properties

Domain: Cognitive Level: Synthesis

Linked Program Outcomes

Solve quality problems using process planning, technical knowledge, teamwork, mathematics, and critical thinking

Use CAD and CAM programs to design parts and program manufacturing machines

3. Perform software communications between PC and CNC equipment

Properties

Domain: Cognitive Level: Application

Linked Program Outcomes

Solve quality problems using process planning, technical knowledge, teamwork, mathematics, and critical thinking

Use CAD and CAM programs to design parts and program manufacturing machines

4. Enter CNC Program into control

Properties

Domain: Psychomotor Level:

Linked Program Outcomes

Operate machine tool equipment commonly found in industry including manual and computer-controlled lathes, milling machines, drill presses and cutting machines

Demonstrate employability skills needed to obtain and retain employment in machine tool and related fields

5. Enter programs in MDI (manual data input)

Properties

Domain: Psychomotor Level:

Linked Program Outcomes

Operate machine tool equipment commonly found in industry including manual and computer-controlled lathes, milling machines, drill presses and cutting machines

Demonstrate employability skills needed to obtain and retain employment in machine tool and related fields

6. Edit CNC programs

Properties

Domain: Cognitive Level: Application

Linked Program Outcomes

Use CAD and CAM programs to design parts and program manufacturing machines

Solve quality problems using process planning, technical knowledge, teamwork, mathematics, and critical thinking

7. Perform sequence search to restart or edit programs

Properties

Domain: Psychomotor

Linked Program Outcomes

Operate machine tool equipment commonly found in industry including manual and computer-controlled lathes, milling machines, drill presses and cutting machines

Use CAD and CAM programs to design parts and program manufacturing machines

8. Execute CNC program sequences from zero or point of reference

Properties

Domain: Cognitive Level: Application

Linked Program Outcomes

Operate machine tool equipment commonly found in industry including manual and computer-controlled lathes, milling machines, drill presses and cutting machines

Demonstrate employability skills needed to obtain and retain employment in machine tool and related fields

9. Execute emergency stop and restart procedures

Properties

Domain: Cognitive Level: Application

Linked Program Outcomes

Operate machine tool equipment commonly found in industry including manual and computer-controlled lathes, milling machines, drill presses and cutting machines

Demonstrate employability skills needed to obtain and retain employment in machine tool and related fields

10. Interrupt automatic cycle mode manually to stop potential damage to part and/or machine

Properties

Domain: Cognitive Level: Application

Linked Program Outcomes

Operate machine tool equipment commonly found in industry including manual and computer-controlled lathes, milling machines, drill presses and cutting machines

Manufacture parts from various materials in accordance with specifications from blueprints, electronic drawings, and shop sketches

Apply safety principles in a work environment to minimize hazards and prevent losses to productivity

11. Orient machine axis with holding devices

Properties

Domain: Psychomotor Level:

Linked Program Outcomes

Operate machine tool equipment commonly found in industry including manual and computer-controlled lathes, milling machines, drill presses and cutting machines

Manufacture parts from various materials in accordance with specifications from blueprints, electronic drawings, and shop sketches

Apply safety principles in a work environment to minimize hazards and prevent losses to productivity

12. Thread interior and exterior surfaces

Properties

Domain: Psychomotor

Linked Program Outcomes

Operate machine tool equipment commonly found in industry including manual and computer-controlled lathes, milling machines, drill presses and cutting machines

Manufacture parts from various materials in accordance with specifications from blueprints, electronic drawings, and shop sketches

Solve quality problems using process planning, technical knowledge, teamwork, mathematics, and critical thinking

Apply safety principles in a work environment to minimize hazards and prevent losses to productivity

13. Determine spindle speed and feed rate

Properties

Domain: Cognitive Level: Application

Linked Program Outcomes

Solve quality problems using process planning, technical knowledge, teamwork, mathematics, and critical thinking

Apply safety principles in a work environment to minimize hazards and prevent losses to

productivity

14. Perform facing operations to rough or finish surfaces

Properties

Domain: Psychomotor

Linked Program Outcomes

Operate machine tool equipment commonly found in industry including manual and computer-controlled lathes, milling machines, drill presses and cutting machines

Manufacture parts from various materials in accordance with specifications from blueprints, electronic drawings, and shop sketches

Apply safety principles in a work environment to minimize hazards and prevent losses to productivity

Demonstrate employability skills needed to obtain and retain employment in machine tool and related fields

15. Perform turning operations to rough or finish a surface

Properties

Domain: Psychomotor

Linked Program Outcomes

Operate machine tool equipment commonly found in industry including manual and computer-controlled lathes, milling machines, drill presses and cutting machines

Manufacture parts from various materials in accordance with specifications from blueprints, electronic drawings, and shop sketches

Apply safety principles in a work environment to minimize hazards and prevent losses to productivity

16. Adjust tool offsets

Properties

Domain: Psychomotor

Linked Program Outcomes

Operate machine tool equipment commonly found in industry including manual and computer-controlled lathes, milling machines, drill presses and cutting machines

Manufacture parts from various materials in accordance with specifications from blueprints, electronic drawings, and shop sketches

17. Verify CNC programs prior to executing program sequence

Properties

Domain: Cognitive Level: Evaluation

Linked Program Outcomes

Operate machine tool equipment commonly found in industry including manual and computer-controlled lathes, milling machines, drill presses and cutting machines

Solve quality problems using process planning, technical knowledge, teamwork, mathematics, and critical thinking

Use CAD and CAM programs to design parts and program manufacturing machines

18. Bore cylindrical surfaces on CNC equipment

Properties

Domain: Psychomotor Level:

Linked Program Outcomes

Operate machine tool equipment commonly found in industry including manual and computer-controlled lathes, milling machines, drill presses and cutting machines

Manufacture parts from various materials in accordance with specifications from blueprints,

electronic drawings and shop sketches

Apply safety principles in a work environment to minimize hazards and prevent losses to productivity

19. Power up and power down CNC machines

Properties

Domain: Psychomotor

Linked Program Outcomes

Operate machine tool equipment commonly found in industry including manual and computer-controlled lathes, milling machines, drill presses and cutting machines

Demonstrate employability skills needed to obtain and retain employment in machine tool and related fields

20. Plan CNC machining operations

Properties

Domain: Cognitive Level: Synthesis

Linked Program Outcomes

Solve quality problems using process planning, technical knowledge, teamwork, mathematics, and critical thinking

21. Adjust cutter compensation to maintain accuracy of cuts

Properties

Domain: Affective Level: Organizing

Linked Program Outcomes

Operate machine tool equipment commonly found in industry including manual and computer-controlled lathes, milling machines, drill presses and cutting machines

Manufacture parts from various materials in accordance with specifications from blueprints, electronic drawings, and shop sketches

Apply safety principles in a work environment to minimize hazards and prevent losses to productivity

22. Ream holes to specification with CNC lathes and mills

Properties

Domain: Psychomotor Level:

Linked Program Outcomes

Operate machine tool equipment commonly found in industry including manual and computer-controlled lathes, milling machines, drill presses and cutting machines

Manufacture parts from various materials in accordance with specifications from blueprints, electronic drawings, and shop sketches

Apply safety principles in a work environment to minimize hazards and prevent losses to productivity