DRAFTER (TOOL DESIGN)

APPENDIX A

O*NET CODE 17-3013.00

This training outline is a minimum standard for Work Processes and Related Instruction. Changes in technology and regulations may result in the need for additional on-the-job or classroom training.

WORK PROCESSES

Approximate Hours

A. Tools, Equipment and Work Aids **800**

1. Familiarization with machine tools
2. Using and caring for print machine
3. CAD CAM: Using and caring for computer-aided drafting terminal, keyboard, mouse and/or stylus and digitizing tablet
4. Understanding and using sketches, rough drawings, designs, tool designer instructions, and pictorial drawings
5. Understanding and using industry specification manuals, handbooks, technical specifications, commercial catalogs, reference library resources, CAD manuals and tutorials
6. Using and caring for plotters, printers, Mylar, tracing paper
7. Documenting procedures, managing files; setting up project directories

B. Work Planning **300**

1. Analyzing specifications, ideas, concepts, sketches, engineering drawings, and related data supplied by Tool Designer
2. Determining critical factors affecting design of tools
3. Applying knowledge of previous designs and manufacturing processes and limitations
4. Determining scale and method of presentation
5. Determining priorities, sequence of work
6. Following written procedures

C. Blueprint Reading **400**

1. Reading orthographic projections
2. Reading geometric constructions
3. Reading auxiliary views
4. Reading sectional views
5. Understanding dimensioning procedures
6. Understanding geometric tolerancing and dimensioning
7. Reading fastener and hardware blueprints
8. Reading gear blueprints
9. Reading layout and assembly blueprints
10. Reading welding and tool industry symbols

D. Basic Drafting **2,000**

Producing drawings of tool designs using CAD systems:

1. Sketching orthographic projections
2. Drafting multiple view assemblies, sub-assemblies, and layout drawings
3. Determining sequence of work and method of presentation
4. Demonstrating an understanding of the basics of production, repair and alteration of machine tools and related equipment
5. Interpreting rough sketches, designs, notes, instructions, and specifications provided by tool designer
6. Drafting detailed drawings of tools and related parts
7. Drawing plans to scale, dimensioning
8. Drawing fasteners and hardware when applicable
9. Changing drawings using tracing paper, overlays, CAD systems
10. Reproducing drawings

E. Making Calculations **400**

1. Understanding and using metric system
2. Compiling tolerances and dimensions
3. Checking dimensions and industry specifications of materials to be used
4. Checking weights, volumes and stress factors provided by engineer or tool designer

5. Consulting tool design handbooks, commercial catalogs, charts
6. Projecting amount of materials required, assigning numbers to materials list (optional)
7. Determining scale
8. Calculating angles and curvature of parts
9. Costing and estimating

F. Tool Design Drafting **2,800**

Producing working drawings following designs and specifications indicated by Tool Designer:

1. Understanding basics of tool design methods, engineering principles and manufacturing
2. Identifying tolerances and dimensions
3. Applying standard tool manufacturing industry specifications
4. Drafting manufacturing drawings, layout drawings
5. Drafting detailed drawings of parts illustrating shape, conforming dimensions, tolerances, materials, finishes, and heat treatment where applicable
6. Drafting standard tool parts and devices such as drill jigs, gages, cams, single and multiple station dies, lathe tools, mill fixtures, assembly fixtures, welding fixtures, and circular form tools
7. Drafting tool presentation drawings
8. Drafting tool sectional drawings
9. Using basic knowledge of metallurgy to select appropriate schedule of materials
10. Drafting mechanical jigs and fixtures
11. Drawing cutting tool developments
12. Revising drawings, conferring with tool designers, engineers, tool makers or customers as appropriate
13. Assisting team to solve tool design problems, drawing revisions
14. Preparing optical comparator charts

G. CAD CAM Drafting **900**

1. Applying knowledge of computer language
2. Using appropriate editing commands

3. Choosing between appropriate software and manual programming
4. Applying construction commands
5. Using object modification functions
6. Applying knowledge of exclusive features
7. Keeping abreast of new computer technology and software developments
8. Demonstrating mastery of advanced tasks and automatic programming

H. Assuring Quality **400**

1. Inspecting finished drawings' detail for fit, form and function
2. Checking accuracy of scale, dimensions, conformance to standards and design specifications
3. Checking symbols and conventions
4. Checking clarity of lines and figures
5. Applying international standards such as ISO 9000 and QS 9000
6. Modifying drawings as directed by Tool Designer
7. Conferring with work team throughout process

Approximate Total Hours **8,000**

Apprenticeship work processes are applicable only to training curricula for apprentices in approved programs. Apprenticeship work processes have no impact on classification determinations under Article 8 or 9 of the Labor Law. For guidance regarding classification for purposes of Article 8 or 9 of the Labor Law, please refer to https://dol.ny.gov/public-work-and-prevailing-wage

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APPENDIX B

RELATED INSTRUCTION

Safety

1. Fundamentals including fire, electrical, Right-to-Know, OSHA and Emergency Procedure
2. Trade Safety including VDT Precautions, Ergonomics, machine shop and manufacturing floor safety
3. First Aid (minimum 6.5 hours every 3 years)
4. Sexual Harassment Prevention Training – must comply with Section 201-g of the Labor Law

Blueprint Fundamentals

1. Reading, interpreting part prints
2. File management procedures
3. Drawing and Sketching
4. Blueprint Production
5. Orthographic Projections
6. Geometric Constructions
7. Sectional Views and Auxiliary Views
8. Dimensioning Procedures
9. Fasteners and Hardware
10. Gears
11. Layout and Assembly Drawings
12. Symbology, including welding and tool design symbols

Mathematics

1. Fundamentals
2. Applied Algebra
3. Applied Geometry, Geometric Construction
4. Applied Trigonometry
5. Applied Statistics, including Statistical Process Control
6. Metric System
7. Engineering Handbooks, Tables, and Reference Software

8. Technical Applications: calculating reduced scales, weights, tolerances, stress factors, verifying drawing and original part dimensions

Quality Control Process

1. Performing Quality Assurance Checks, record keeping
2. Modifying Drawings in conjunction with Engineering and Production Shop
3. Company standards, ISO 9000 standards, QS 9000 standards

Trade Theory

1. Tools, machines, and equipment, including knowledge of applicable machine tools
2. Materials and physical properties
3. Terminology
4. Drafting industry standards, operation, and practice
5. Reference materials, catalogs, engineering handbooks and software
6. Production shop layouts and operation
7. Mechanical and tool making processes, NC, and CNC
8. Work Sequencing
9. Methods of Presentation: Geometric Constructions, Orthographic Projections, Auxiliary Views, Sectional Views
10. Machine Presentation Drawings
11. Lettering, Tracing, Trade Symbols
12. Layout and Assembly Drawings, Working Drawings

Trade Science

1. Background in Tool Design
2. Metallurgy
3. Heat Treatment
4. Applied Physics
5. Mechanics, Hydraulics and Pneumatics
6. Mechanical Drawing
7. Engineering Drawing and Graphics
8. Machine Tool Design
9. Machine manufacturing processes

10. Jigs and fixtures
11. Numerical Control Drafting
12. Presentation Renderings (Optional)

Computer Aided Drafting (CAD)

1. Introduction to basics of computer use including keyboard, stylus, mouse, and tablet
2. Set-up commands
3. Developing shapes and drawings descriptions
4. Developing dimension and scale descriptions
5. Editing commands
6. Construction commands and object modification
7. Plotting and projection
8. Customizing with programs such as “Auto CAD” including custom menus, creating
9. special files, three-dimension modeling
10. Advanced CAD applications to more complex tool design applications, two- and three-dimensional design
11. Overview of current CAD commercial packages and enhancements

Industrial and Labor Relations

1. History and Background
2. Current Laws and Practices

Other Workplace Skills

1. Communications: including management, customer, engineering, and manufacturing
2. Decision Making and Problem-Solving Techniques
    a. Basic Problem Solving
    b. Applied Decision Making
    c. Group Team Concepts
3. Applications of Electricity and Electronics to the Tool Design Drafter Trade

Other Related Courses as Necessary

144 Hours of Related Instruction are Required for Each Apprentice for Each Year.

Appendix B topics are approved by New York State Education Department.