

## **DRAFTER (AUTOMOTIVE PRODUCT 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**

**100**

1. Using and caring for tools such as: drafting table, triangle, T-square, rulers, drawing instruments, inking tools, templates, lettering guides, compass.
2. Using and caring for print machine.
3. CADD CAM: Using and caring for computer-aided drafting terminal, mouse and/or stylus and digitizing tablet.
4. Understanding and using sketches, rough drawings, tracing paper, pictorial drawings.
5. Understanding and using books, charts, technical specifications, and reference library.
6. Using and caring for plotters, printers, mylar.
7. Documenting procedures; files; setting up project directories.

##### **B. Blueprint Reading**

**200**

1. Reading standard blueprints.
2. Reading orthographic projections.
3. Reading geometric constructions.
4. Reading auxiliary views.
5. Reading sectional views.
6. Understanding dimensioning procedures.
7. Reading fastener and hardware blueprints.
8. Reading gear blueprints
9. Reading detailed layout and assembly blueprints.

**C. Work Planning** **200**

1. Analyzing specifications, ideas, concepts, sketches, engineering drawings, and related design data.
2. Determining critical factors affecting design of components.
3. Applying knowledge of previous designs and manufacturing processes and limitations.
4. Determining scale and method of presentation.
5. Determining priorities, sequence of work.

**D. Quality Assurance Standards** **700**

1. Applying company procedures and standards throughout production process, C of C.
2. Insuring drafting and product standards, gaging standards, communicating concerns or potential problems appropriately.
3. Applying ISO 9,000, QS 9,000 and other standards applicable.
4. Conferring with Automotive Engineers, Product Design Engineers and others to resolve design problems.
5. Drawing product revisions to size, shape, and arrangement of parts to create practical design.

**E. Manual Drafting Basics** **1,000**

1. Drawing rough sketches
2. Drawing preliminary and advanced three-dimensional product parts and lettering freehand.
3. Board drafting three dimensional, multiple view assemblies, subassemblies and layout drawings.
4. Understanding basics of manufacture, repair and alteration of engines and related automotive components.
5. Inking lines, symbols and letters on pencil drawings, Roman Simplex and Complex.
6. Drafting detailed drawings of engine parts and associated components.
7. Reviewing rough sketches and checking engineering specifications, mark-ups and check-plots, developing into working design drawings.
8. Changing drawings using tracing paper and overlays.
9. Drawing specific and high volume parts.

10. Drafting sectional views, auxiliary views, orthographic and geometric constructions.

## **F. Making Calculations**

**300**

1. Performing mathematical computations using conventional and computerized aids.
2. Applying knowledge of mathematics, formulas and physical laws.
3. Working out detailed specifications of components, compiling tolerances and dimensions, materials to be used, using metric system, creating numbered materials lists.
4. Calculating weights, volumes and stress factors.
5. Consulting with automotive product engineers, product manufacturing staff and machining.
6. Calculating other materials needed, projecting amounts required.
7. Determining scale.

## **G. Automotive Product Design and Drafting**

**3,000**

1. Applying knowledge of general mechanical and engineering principles and practices to development of working design drawings for research and production.
2. Demonstrating understanding of design research and product design.
3. Generating product working layouts and master drawings from concepts, sketches, models, prototypes, specifications and verbal instructions.
4. Applying knowledge of engine design, manufacturing processes, capabilities and limitations, assembly procedures, and tear-down; pickups, tool room.
5. Identifying tolerances and dimensions.
6. Using standard and company specific industrial/manufacturing specifications.
7. Designing high volume parts such as plastic, P.M. castings, and perm mold.
8. Drafting system assembly drawings and reduced scale assembly drawings from layout drawings, detailing simple and complex assemblies and panel layouts.
9. Drafting complete, multiple view, detail part and component drawings from assembly drawings; detailing

shape, dimensions, tolerances, finishes, materials and heat treatment where appropriate.

10. Drafting standard automotive parts using technical references and handbooks, computer files.
11. Drafting product part presentation drawings.
12. Applying basic knowledge of metallurgy to select appropriate schedule of materials.
13. Drafting jigs and fixtures (optional).
14. Modifying drawings after conferring with engineers, production staff, machinists and others, assisting in solving engineering problems, using change control system, flow and purpose of documents, CTC methods (optional).
15. Producing working layouts and final master drawings adequate for detailing parts and units of design.
16. Following up on job designs.

#### **H. CADD CAM Basics and Special Applications**

**2,200**

1. Editing commands.
2. Construction commands, object modification, re-designs.
3. Using exclusive features.
4. Using special and advanced applications.
5. Applying change control system, flow and purpose of documents, CTC methods.
6. Producing layouts, tolerance stackups.
7. Keeping abreast of current computer technology relating to automotive and engine design.

#### **I. Costing and Estimating (Optional)**

**300**

1. Preparing material lists, applying costs.
2. Estimating or contributing to projection of production costs.
3. Coordinating with purchasing.

**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>.*

## **DRAFTER (AUTOMOTIVE PRODUCT DESIGN)**

### **APPENDIX B**

#### **RELATED INSTRUCTION**

##### **Safety**

1. Fundamentals – Fire, Electrical, Right-to-Know (Hazardous Communications), OSHA, Emergency Procedure
2. Trade Safety
  - a. Drafting Room: VDT Precautions, Ergonomic Furnishings
  - b. Manufacturing Floor, Tool Room and Model Area Safety
  - c. First Aid (minimum 6.5 hours every 3 years)
3. Sexual Harassment Prevention Training – must comply with Section 201-g of the Labor Law

##### **Blueprint Fundamentals**

1. Reading, Interpreting and Procedures
2. Blueprint Production
3. Drawing and Sketching
4. Orthographic Projection
5. Geometric Constructions
6. Sectional Views and Auxiliary
7. Dimensioning Procedures
8. Fasteners and Hardware
9. Gears
10. Layout and Assembly Drawings
11. Welding Symbols

##### **Quality Control Processes**

1. ISO 9,000 and QS 9,000 Standards, Company Standards

##### **Mathematics**

2. Fundamentals
3. Algebra
4. Geometric Construction

5. Trigonometry
6. Calculus Basics
7. Metric System
8. Use of Engineering Handbooks, Reference Tables
9. Trade Applications
  - a. Calculating Reduced Scales
  - b. Calculating Weights
  - c. Calculating Tolerances
  - d. Calculating Stress Factors

## **Technical Physics**

### **Trade Theory**

1. Tools, Machine and Equipment
2. Strength of Materials
3. Terminology
4. Drafting Department Practice and Operation
5. Handbooks, Catalogs and Reference Material
6. Production Shop Layout and Operation
7. Mechanics Fundamentals
8. Machine Theory and Operations
9. Mechanics of Energy Systems
10. Mechanical Drawing
11. Work Sequencing
12. Methods of Presentation
  - a. Geometric Construction
  - b. Orthographic Projecting
  - c. Auxiliary Views
  - d. Sectional Views
13. Machine Presentation Drawing
14. Lettering and Tracing
15. Detailing, Welding Symbols
16. Layout and Assembly Drawings, Working Drawings
17. Designing Introduction, Design Research and Testing
18. Visualizing Multiple Perspective Drawings

## 19. Conceptualizing Inside Complex Processes

### **Trade Science**

1. Principles of Automotive Components
2. Metallurgy Applied to Automotive Components
3. Heat Treatment of Metals
4. Mechanics of Automotive Engines
5. Engineering Problem Solving Techniques
6. Engine and Automotive Component Design
7. Dimensioning Procedures (Geometric & Tolerancing)
8. Automotive Component Manufacturing Processes
9. Industrial Hydraulics
10. Numerical Control Drafting and Programming of Machine Tools
11. Automotive Manufacturing Jigs and Fixtures

### **Computer Aided Drafting (CADD)**

1. Introduction for (CADD)  
Drawing Set Up Commands and Data Entry Methods
2. Developing the Shape and Drawing Description
3. Developing Dimension and Scale Description
4. CAD Mechanical Detailing
5. File Management
6. Editing Commands
7. Construction Commands and Object Modification
8. Exclusive Features
9. Advanced CADD Tasks
10. Introduction to Robotics

### **Industrial and Labor Relations**

1. History and Background
2. Current Laws and Practices
3. Communications: Management, Customer, Engineering, Machining and Production
4. Problem Solving, Group Team Problem Solving

### **American with Disabilities Act Overview (Optional)**

**Other Related Courses as necessary or required by employer**

144 Hours of Related Instruction are required for each Apprentice for each year.

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