I. **Objective:** Developed to meet the industry demands and provide an six-week certification program to fast track individuals to secure a position in the manufacturing industry as entry level machine operator or production worker. Instruction will include education on adequately operating manual or CNC equipment, and maintaining quality parts in respect to utilizing safe machining methods.

II. **Course Outline:**

A. **Basic Blue Print Reading**

1. **Expected Learning Outcomes**

   a) Students will use vocabulary peculiar to the trade
   b) Students will learn different line types and their uses
   c) Students will demonstrate the use of different size prints and paper sizes
   d) Students will construct 3-d view drawings using top, side, and bottom views to interpolate
   e) Students will determine tolerance and dimension specifications from reading Blueprints
   f) Students will compare accuracies of finished parts to blueprints
   g) Students will utilize Bill of materials using information from Blueprint

2. Understanding importance of blue prints and the need in the industry

3. Understanding how blue prints are generated

4. Understanding features of blue prints and what each is used for and how to identify

   a) Solid lines
   b) Hidden lines
   c) Center lines
   d) Extension lines
   e) Dimension lines
   f) Leaders
   g) Title blocks
   h) Notations
   i) Different views and why they are needed
   j) Tolerancing

5. **Outline of Topics**

   a) Unit 1 & 2 - Bases for Blueprint Reading, Alphabet of Lines and Object Lines
b) Unit 3&4 – Hidden Lines, Center Lines, Extension Lines, and Dimension Lines

c) Unit 5&6 – Projection Lines, Other and Line Combinations. Three View Drawings

d) Unit 7&8 – Arrangement of Views, Two View Drawings

e) Unit 9&10- One View Drawings, Auxiliary Views

f) Unit 11&12- Size and Location Dimensions, Dimensioning Cylinders and Arcs

g) Unit 13&14- Size Dimensions for Holes, Location Dimensions for Points

h) Unit 15&16&17- Base Line Dimensioning, Tolerances, Unilateral & Bilateral

i) Unit 18- Interchangeable Parts, Allowances, and Class of Fit

j) Unit 19&20- External Screw Threads, Internal and Left Handed Threads

k) Unit 21&22- Tapers, Shop Notes, Metric System Dimensioning

l) Unit 23&24- Metric System Dimensioning, First Angle Projection

m) Unit 25&26- Metric Screw Threads, Cutting Planes

n) Unit 27&28- Half Sections, Partial Section, Ordinate and Tabular Dimensioning

o) Unit 29- Geometric Dimensioning and Tolerancing

p) Unit 40 to 42- Orthographic, Isometric, Oblique Sketching

B. Industrial Math – Math pertaining to the machining field

1. Fractions

   a) Addition of fractions
   b) Subtraction of fractions
   c) Division of fractions
   d) Multiplication of fractions
   e) Converting fractions to decimals

2. Decimals

   a) Addition of decimals
   b) Subtraction of fractions
   c) Division of fractions
   d) Multiplication of fractions
   e) Converting decimals to fractions

3. Understanding the basic metric system

   a) Convert inches to metric
   b) Convert metric to inches

4. Simplified geometry and trigonometry

   a) Application of geometry in the field
   b) Application of trigonometry in the field
Manufacturing Technician Training

C. Dimensional Metrology

1. Expected Learning Outcomes

   a) Students will use vocabulary peculiar to the trade
   b) Students will learn how measurement is essential at many levels. (Skilled, production, and scientific)
   c) Students will explain why statistical control is based on measurements that have already been taken
   d) Students will construct statistical spreadsheets, and use it to predict what the future measurements will be
   e) Students will be able to use graduated scales within recognized limitations
   f) Students will read Vernier and dial instruments
   g) Students will read and use Micrometer and digital instruments
   h) Students will read and use gage blocks and production gage instruments

2. Learning nomenclature of semi-precision and precision instruments

3. Learn to fluently read and use the following instruments

   a) Tape measure – learn to fluently read and use
   b) Steel rule
   c) Dial calipers
   d) Micrometers
   e) Veneer calipers
   f) Veneer height gauge
   g) Dial height gauge
   h) Gauge pins
   i) Surface plates
   j) Angle plates
   k) Indicators

D. Machining Procedures

1. Expected Learning Outcomes

   a) Students will use vocabulary peculiar to the trade
   b) Students will identify proper safety procedures
   c) Students will calculate speeds and feeds for specific cutters and applications
   d) Students will calculate tap drill sizes for specific tap sizes
   e) Students will select proper layout procedures and tools for part layout
   f) Students will perform precision measuring using micrometers and calipers
   g) Students will operate band saw, and cut off saw to perform intermediate operations
   h) Students will operate tool room lathe to perform intermediate operations
i) Students will operate vertical milling machine to perform intermediate operations
j) Students will operate surface grinders to perform intermediate operations
k) Students will select and sharpen cutting tools to perform intermediate operations

2. Machine Shop Safety
   a) Eye protection
   b) Long hair
   c) Proper clothing
   d) Jewelry
   e) Lock out
   f) Machine hazards

3. Layout
   a) Layout bench
   b) Height gage
   c) Squares and scribes

4. Measuring Tools
   a) Micrometer
   b) Calipers
   c) Height gages
   d) Rules

5. Manual engine lathe (Tool room lathe)
   a) Turning
   b) Drilling
   c) Boring
   d) Threading

6. Manual milling machine (Vertical milling machine)
   a) End milling
   b) Drilling
   c) Reaming
   d) Tapping

7. Manual cut-off saw / Band Saw

8. CNC lathe

9. CNC mill
Manufacturing Technician Training

10. Learn all basic machine shop cutting tools

  a) Center drills
  b) End mills
  c) Taps
  d) Reamers

III. Method of Instruction:

A. Lecture / Discussion

B. Class Demonstration / Labs

IV. Required Materials:

- Textbooks
- Pencil
- Calculator
- Safety Glasses
- Flash Drive
- Composition Notebook
- Spiral Notebook
- Calipers (provided and included in class cost)
- 6” scale (provided and included in class cost)
- 0-1 micrometer (provided and included in class cost)

V. Method of Evaluation

A. Attendance

B. Quizzes / Tests

C. Instructor Observation

D. Lab Assignments
## Manufacturing Technician Training

### Week 1) 12 hours total class time.

<table>
<thead>
<tr>
<th>Day 1)</th>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00am – 10:00am</td>
<td>Introduction to safety – covering safety procedures and practices to ensure that all individuals remain unharmed and also the people surrounding the area.</td>
<td></td>
</tr>
<tr>
<td>10:00am – 12:00pm</td>
<td>Introduction to Blueprint reading. This will enable the individual to read and interpret blueprints to ensure that the individual would be able to maintain quality parts while running the machinery.</td>
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<table>
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<tr>
<th>Day 2)</th>
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<tbody>
<tr>
<td>8:00am – 10:00am</td>
<td>Continuation and overview of Blueprint reading. Refining their experience of evaluating the dimensions and tolerances.</td>
<td></td>
</tr>
<tr>
<td>10:00am – 12:00pm</td>
<td>Introduction of Mathematics used in the industry, consisting of fractions, decimals, geometry, and trigonometry and the applications of each.</td>
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<tr>
<td>8:00am – 10:00am</td>
<td>Continuation of Mathematics used in the industry, consisting of fractions, decimals, geometry, and trigonometry and the applications of each.</td>
<td></td>
</tr>
<tr>
<td>10:00am – 12:00pm</td>
<td>Introduction to Dimensional Metrology. This will enable the individual to read and measure scales, calipers, and micrometers in order to maintain quality parts while running the machinery.</td>
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### Week 2) 12 hours total class time.

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<tr>
<td>8:00am – 10:00am</td>
<td>Continuation of Dimensional Metrology. This will enable the individual to read and measure scales, calipers, and micrometers in order to maintain quality parts while running the machinery.</td>
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</tr>
<tr>
<td>10:00am – 12:00pm</td>
<td>Introduction to Machining Procedures. This will enable the individual to operate a manual milling machine to perform basic operations.</td>
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<tbody>
<tr>
<td>8:00am – 10:00am</td>
<td>Continuation of Introduction to Machining Procedures. This will enable the individual to operate a manual engine lathe to perform basic operations.</td>
<td></td>
</tr>
<tr>
<td>10:00am – 12:00pm</td>
<td>Continuation of Introduction to Machining Procedures. This will enable the individual to operate a cut off saw and basic machine shop cutting tools to perform basic operations.</td>
<td></td>
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<tbody>
<tr>
<td>8:00am – 10:00am</td>
<td>Continuation of Introduction to Machining Procedures. This will enable the individual to operate CNC lathe to perform basic operations.</td>
<td></td>
</tr>
<tr>
<td>10:00am – 12:00pm</td>
<td>Continuation of Introduction to Machining Procedures. This will enable the individual to operate CNC mill to perform basic operations.</td>
<td></td>
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</tbody>
</table>

### Week 3) 12 hours total class time.

<table>
<thead>
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<tbody>
<tr>
<td>8:00am – 10:00am</td>
<td>Under close supervision, Individual will demonstrate machine shop safety procedures– covering safety procedures and practices to ensure that all individuals remain unharmed and also the people surrounding the area.</td>
<td></td>
</tr>
<tr>
<td>10:00am – 12:00pm</td>
<td>Under close supervision, Individual will demonstrate reading and interpreting blueprints to ensure that the individual would be able to maintain quality parts while running the machinery.</td>
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<tr>
<td>8:00am – 10:00am</td>
<td>Under close supervision, Individual will demonstrate their understanding of evaluating the dimensions and tolerances.</td>
<td></td>
</tr>
<tr>
<td>10:00am – 12:00pm</td>
<td>Under close supervision, Individual will display understanding of Mathematics used in the industry, consisting of fractions, decimals, and the applications of each.</td>
<td></td>
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<tr>
<td>8:00am – 10:00am</td>
<td>Under close supervision, Individual will display understanding of Mathematics used in the industry, consisting of geometry, and trigonometry and the applications of each.</td>
<td></td>
</tr>
<tr>
<td>10:00am – 12:00pm</td>
<td>Under close supervision, Individual will demonstrate Dimensional Metrology skills including reading and measuring scales, calipers, and micrometers in order to maintain quality parts while running the machinery.</td>
<td></td>
</tr>
</tbody>
</table>
### Week 4) 12 hours total class time.

| Day 1) | 8:00am – 10:00am | Under close supervision, individual will continue to demonstrate Dimensional Metrology skills including reading and measuring scales, calipers, and micrometers in order to maintain quality parts while running the machinery. |
| Day 2) | 8:00am – 10:00am | Under close supervision, Individual will perform basic operations on a manual milling machine. |
| Day 2) | 10:00am – 12:00pm | Under close supervision, Individual will perform basic operations on a manual engine lathe. |
| Day 3) | 8:00am – 10:00am | Under close supervision, Individual will operate a cut off saw and basic machine shop cutting tools to perform basic operations. |
| Day 3) | 10:00am – 12:00pm | Under close supervision, Individual will demonstrate mastery of machine shop safety procedures—covering safety procedures and practices to ensure that all individuals remain unharmed and also the people surrounding the area. |

### Week 5) 12 hours total class time.

| Day 1) | 8:00am – 10:00am | Individual will demonstrate mastery of Dimensional Metrology skills including reading and measuring scales, calipers, and micrometers in order to maintain quality parts while running the machinery. |
| Day 2) | 10:00am – 12:00pm | Individual will demonstrate mastery of reading and interpreting blueprints to ensure that the individual would be able to maintain quality parts while running the machinery. |
| Day 2) | 8:00am – 10:00am | Individual will demonstrate mastery of their understanding of evaluating the dimensions and tolerances. |
| Day 2) | 10:00am – 12:00pm | Individual will display mastery of understanding Mathematics used in the industry, consisting of fractions, decimals, and the applications of each. |
| Day 3) | 8:00am – 10:00am | Individual will display mastery of understanding Mathematics used in the industry, consisting of geometry, and trigonometry and the applications of each. |
| Day 3) | 10:00am – 12:00pm | Individual will demonstrate mastery of Dimensional Metrology skills including reading and measuring scales, calipers, and micrometers in order to maintain quality parts while running the machinery. |

### Week 6) 12 hours total class time.

| Day 1) | 8:00am – 10:00am | Continuation of individual demonstrating mastery of Dimensional Metrology skills including reading and measuring scales, calipers, and micrometers in order to maintain quality parts while running the machinery. |
| Day 1) | 10:00am – 12:00pm | Individual will display mastery of basic operations on a manual milling machine. |
| Day 2) | 8:00am – 10:00am | Individual will display mastery of basic operations on a manual engine lathe. |
| Day 2) | 10:00am – 12:00pm | Individual will display mastery of operating a cut off saw and basic machine shop cutting tools to perform basic operations. |
| Day 3) | 8:00am – 10:00am | Individual will display mastery of operating CNC lathe to perform basic operations. |
| Day 3) | 10:00am – 12:00pm | Individual will display mastery of operating CNC mill to perform basic operations. |