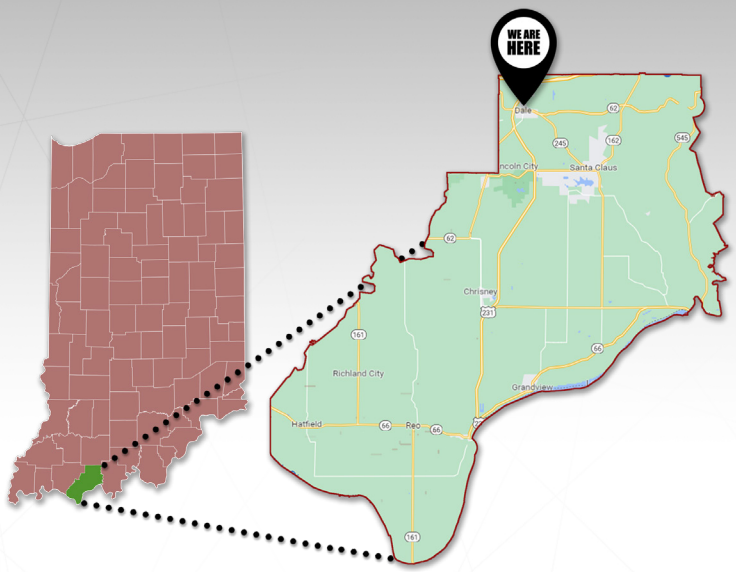
THERMWOOD CORPORATION

5 Axis
BEGINNER LEVEL MACHINE TRAINING



All times are Central Standard Time (CST)

Class Schedule

Mon-Thur: 8:00am - 4:00pm
Fri: 8:00am - Approx. 12:00pm

Office Hours

Mon-Fri: 7:00am - 4:00pm
Office Phone: 800-533-6901
(812)937-4476

Course Overview

Thermwood's 5 Axis Machine Training class is a beginner level course designed to cover basic machine operation procedures as well as CNC programming with the EIA language. The course is a comprehensive combination of lectures on topics in a classroom environment followed by "hands-on" exercises in the adjacent training lab. Each course is limited to 8 students. Each student will be provided their own workstation which will include a computer and any necessary workbooks/notebooks required for the course. Also, each student will have access to one of the five training machines in the lab. Due to variance in class sizes, you may be paired with another student when using one of the five training machines. The class will be specialized to cover all the options you have purchased with your machine.

Key Training Course Topics

- *Understanding of the Cartesian Coordinates system and how it applies to the machine*
- *Preparing the machine for use*
  - » Resetting the machine from E-Stop
  - » Homing the router
  - » Fast Home function
- *Overview of G and M codes*
- *Creating and setting fixture offsets*
- *Utilization of Tip Center Point Control/Function (TCP)*
- *Hand programming the machine using the HHT handheld*
- *Handwriting programs based on dimensional blueprints including-*
  - » Rapid and Linear movements
  - » Arcs & Circles
  - » Using Label calls
  - » Utilizing Sub-Programs
- *Arcs with rotary axes*

Course Objectives

The objectives of this course are to provide the student with the fundamental skills to operate and/or program a Thermwood router in a skillful, accurate, and safe manor. Upon completion of this course, the student should be comfortable with the basic operational procedures involved with running and setting up a Thermwood CNC router. They should be able to accurately set up a program whether it was created manually or through the use of a cad/cam software package.

It is our goal to cover topics such as, but not limited to: manual program creation with the HHP, ability to understand and interpret the G and M code language, successfully utilize the options purchased with the machine (i.e. dual table, dual head, aggregate tooling, rotary devices), proper program alignment/machine setup, tooling setup, and tool changer setup. This is a fast-paced, condensed course on programming and operating a Thermwood router. In order to receive the most from your time in the course, the student should be attentive and ready to learn.

Who Should Attend This Course?

Based on the curriculum covered during the course, it is our recommendation to send an operator as well as a programmer. In order to get the most out of the weeks course, it will be beneficial for you to have the functional user or users in attendance to ensure the acquired knowledge is interpreted adequately.

Required Materials

All workbooks and reference manuals are provided for each student. A notebook and pencil are also provided. The students are encouraged to take notes, create quick reference charts and even flash cards. Tools such as highlighters and page tabs may also be used at the students discretion. A USB drive will be provided at the end of the week to allow each student to back up his/her completed course work to provide examples for future reference.

Course Requirements

1. Attendance is mandatory.
2. It is STRONGLY recommended to have at least a basic level of computer skills in order to keep up with the pace of the course.
3. Students must be fluent with the English language.
4. Cell Phones are necessary tools, but as a common courtesy to those around you, they should be set to an appropriate mode as to not interrupt the class and your classmates from learning.

Course Changes

This document is intended to be a guide for the course and is subject to change without notice at the discretion of the Instructor. Course content must vary from class to class in order to cover different machine options purchased by each customer.

Course Outline

This is a basic course outline and is subject to change at the discretion of the Instructor to accommodate the machine options purchased and the amount of material that must be covered.

DAY 1

- **Introduction**
  - Understanding the Cartesian Grid
  - Right Hand Rule
- **Machine Configuration**
  - Machine orientation
  - Z axis configuration
- **Power Up/Down The Machine**
  - Safely power up/shutdown machine (student exercise)
- **THM Operating Screen**
  - Review the different menu options
  - Settings & Preferences
  - Understanding the Program Display
- **Ultra 6 Supercontrol Panel**
- **Understanding G&M Codes**
  - G&M code definitions
  - Typical program flow
- **Absolute & Incremental Modes**
  - Plot coordinates in absolute and incremental dimension modes (student exercise)
- **Editing At The Control**
  - Create a G code template file (student exercise)
- **Tool Management**
  - Tool Setup
  - Tool Commands
  - Add tool call to template file (student exercise)
- **Machine Variables**
  - Apply Tip Center Point Control (TCP)
  - **Measuring Your Tool**
  - Perform tool measurement (student exercise)
- **Fixture Offset Table**
- **HHT Introduction**
  - Moving with the handheld
  - Programming with the handheld
  - Record a fixture offset (student exercise)

DAY 2

- **Analyzing G Code**
  - General terms
  - Create CNC file for Blueprint with HHT (student exercise)

DAY 3

- **Arcs & Circles**
  - Code Arcs (student exercise)
  - Program the Circle/Square (student exercise)
- **Radius Compensation**
  - Standard rules
  - Typical program flow
  - Add radius comp to file (student exercise)
- **Machine Inputs/Outputs**
  - Add output commands to file (student exercise)
- **Label Routines**
  - Restructure existing program (student exercise)
- **Sub-Programs**
  - Write a Sub-Program (student exercise)
- **Dual Table Programming**
- **Rotory Helix With TCP**
- **Tool Holder Maintenance**
  - Manually eject tool
- **Spline Exercise**
- **Plant Tour**

DAY 4

- **Car Exercise**
  - 3D Spline activity (student exercise)

DAY 5

- **Intro to AFL**
- **Additional Control Options**
- **Q&A**
- **Backup Files**
- **Course Conclusion**