FANUC

CNC TRAINING CATALOG

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FANUC CNC Maintenance and Development courses are broken down into three levels.

The Level I courses are ideal for people new to CNC operations as well as experienced professionals looking to enhance and expand existing troubleshooting skills with current technologies and capabilities. The Level II courses focus on major CNC-related aspects such as in-depth maintenance, the PMC, servos and lasers. Level III courses are highly advanced and geared toward students who may need to develop new, or make major modifications to existing applications.

FANUC offers three levels of programming courses. The Level I courses cover conversational programming on MANUAL GUIDE *i* for milling or turning. The Level II courses range from fundamentals of G-code programming to hands-on machining and turning. The Level III programming courses offer specialized training in the areas of Custom Macro and multi-axis machining.

FANUC Maintenance Certification

FANUC America offers a FANUC Maintenance Certificate Program. Students can earn two levels of certification by successfully completing courses covering a range of maintenance topics. More information on the FANUC Maintenance Certification Program can be found on page 19.

eLearn Training

FANUC also offers a growing number of eLearn training courses so students can learn at their own pace and on their own schedule. For latest information and new courses visit FANUCAmerica.com/CNCtraining.

Hands-On Learning

Small class sizes allow for hands-on learning and individualized attention. Courses include customized training manuals and the use of simulation equipment to enhance the learning experience. Our expert instructors are highly experienced in technical instruction, the CNC industry and field service and have received factory training at the FANUC Corporation headquarters in Japan.

Convenient Locations

Classes are offered at several FANUC America locations across North America. Visit www.FANUCAmerica.com/CNCTraining to see our training schedule and find out which courses will be held in your area. Each training center features comfortable, modern classrooms, Wi-Fi availability and a complimentary lunch provided each day.

FANUC America also provides robotics training in a wide range of topics including Setup & Functionality, Operations & Programming, Electrical Maintenance, as well as Disassembly & Reassembly. For more information contact us: Training@FANUCAmerica.com

Courses can be customized & held at YOUR location

- Save on time and travel expenses
- Convenient and flexible training schedules
- Content customization

888-FANUC-US (888-326-8287) select 2➔4
www.FANUCAmerica.com/CNCTraining

FANUC Maintenance & Development Courses

Level I

FANUC Usage & Maintenance

COURSE # TRCNC40-501 - 4 days

Description:
The FANUC Usage & Maintenance course focuses on the essentials of CNCs and factory automation. This introduction will benefit students of all experience levels who work with FANUC CNCs in a variety of roles, including operators, maintenance professionals, supervisors and engineers.

Topics covered in this course include:

- CNC screens and their purpose
- Memory backup and restoration
- CNC, servo and spindle system hardware
- Troubleshooting CNC and servo alarms and general system failures
- Ladder logic and troubleshooting machine alarms and M-codes
- Introduction to G-code, part program structure and alarms

Course Benefits

FANUC America's maintenance and development courses build upon the knowledge acquired in the Usage & Maintenance course. This course provides an excellent foundation so that students have the necessary knowledge and understanding to take higher-level courses. FANUC recommends that anyone who has not attended the Usage & Maintenance course or a similar introduction/refresher course in the past two years attend this course prior to taking any higher-level courses.

Prerequisites

None.

Who Should Attend

Students of all experience levels who work with FANUC CNCs in a variety of roles, including operators, maintenance professionals, supervisors and engineers.

eLearn Class Available!
FANUC Usage & Maintenance
COURSE #TRC0LM-195

Level I

Understanding the FANUC Power Motion *i* System

COURSE # TRCNC40-236 - 4 days

Description:
This course offers model-specific technical training on troubleshooting techniques and system operation. Suitable for maintenance, application and support professionals; training materials are designed for students with a basic understanding of screen navigation and system applications.

Topics covered in this course include:

- PMC ladder logic, diagnostic tools and hardware
- Maintenance-specific screen navigation
- Memory backup and restoration
- Details of system and servo hardware
- Alarm review and troubleshooting

Course Benefits

This course provides extensive hands-on exercises with simulation equipment. At the conclusion of this course, students will possess an expert level of application and maintenance knowledge.

Prerequisites

None.

Who Should Attend

Students of all experience levels who work with Power Motion *i* systems.

Contact Us

For questions call FANUC America technical training at 888-FANUC-US (888-326-8287) select 2➔4, or go to

www.FANUCAmerica.com/CNCTraining

Level II

FANUC Intensive Maintenance

COURSE # TRCNC40-601 - 4 days

Description:
The Intensive Maintenance course was developed for maintenance professionals who are highly experienced with FANUC CNCs. This course will improve knowledge of system features and enhance existing troubleshooting skills while demonstrating the latest maintenance features of FANUC's controls.

Topics covered in this course include:

- In-depth CNC parameter and diagnostic explanation
- Setup of DNC, Ethernet networking and remote access to the CNC
- Advanced CNC memory backup and restoration
- Servo Guide Mate, Maintenance Monitor, PMC Trace and many more built-in utilities
- Dual Check Safety, FANUC Serial Servo Bus and several other system features
- Innovative alarm troubleshooting with the Failure Diagnosis Monitor and Smart Troubleshooting function

Course Benefits

This course offers extensive opportunities for independent hands-on exercises with simulation equipment. At the conclusion of the course, students will possess expanded troubleshooting skills and increased confidence in performing maintenance duties.

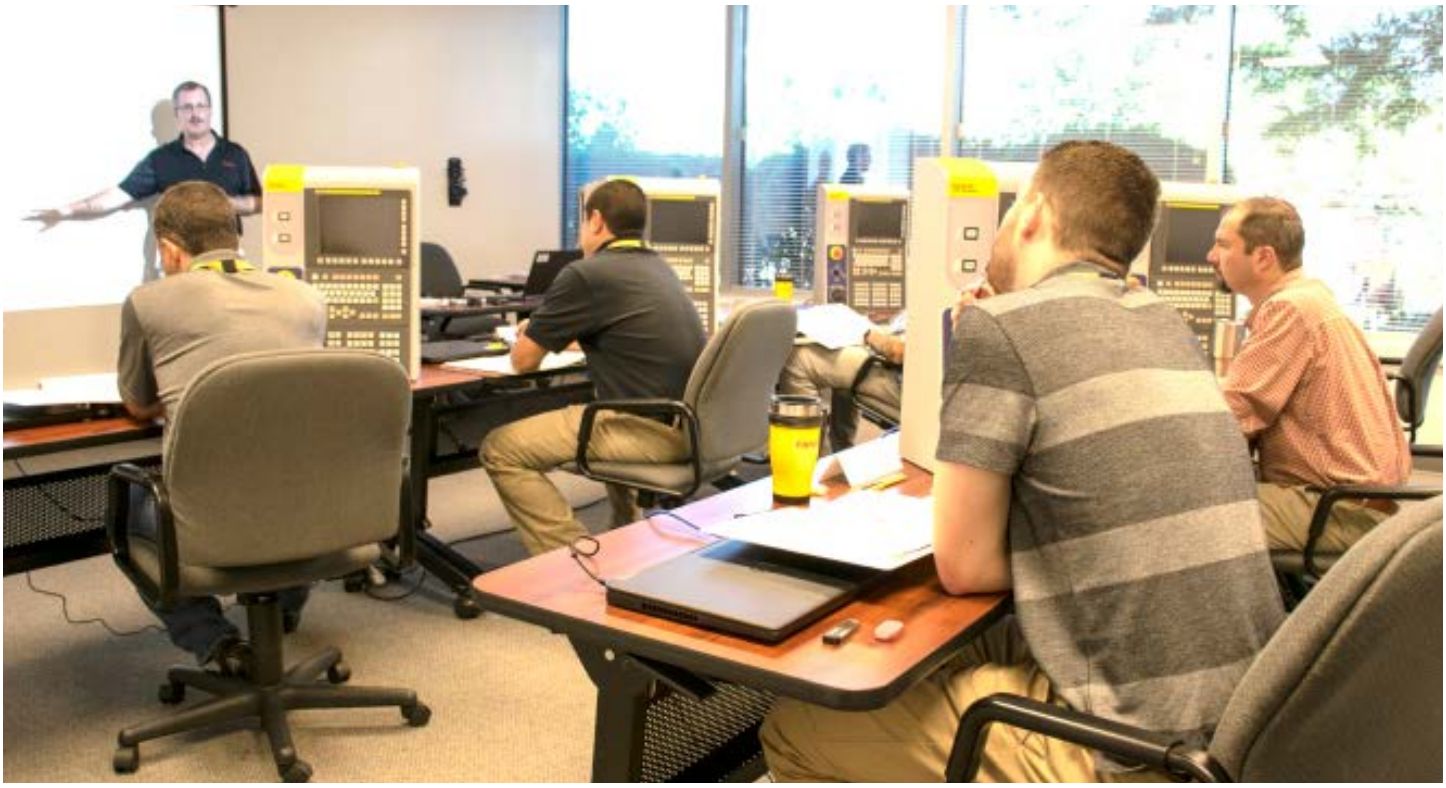
Prerequisites

Successful completion of the FANUC Usage & Maintenance course.

Who Should Attend

Maintenance, application and support professionals.

Student Feedback:
"This class clearly advanced my knowledge of solving actual problems that I will encounter on my control."
- Ryan M. Level II Maintenance Course



FANUC Maintenance & Development Courses

Level II

Understanding the FANUC PMC System

COURSE # TRCNC40-298 - 4 days

Description:

The Programmable Machine Control (PMC) system is the interface between the FANUC CNC and the machine tool. This course will help you understand how the PMC system works by explaining the Input/Output hardware, software screens, digital signals and functional instructions that are used in the PMC. Understanding how each piece in the ladder works is key to being able to develop your own, as well as performing maintenance or debugging. Troubleshooting tools and maintenance procedures are covered to help students understand and eliminate machine-side electrical interface troubles. An introduction to ladder editing and development is also provided.

Topics covered in this course include:

- PMC screen navigation
- Ladder and PMC parameter back-up and restoration
- Advanced contact and coil logic
- Complete sub-function explanations
- Comparison of PMC software types and hardware models
- Machine tool builder alarm/message and PMC system alarm troubleshooting
- Introduction to ladder editing and development

Course Benefits

This course provides extensive hands-on exercises with simulation equipment. At the conclusion of this course, students will process an expert level of application and maintenance knowledge.

Prerequisites

Successful completion of the FANUC Usage & Maintenance course.

Who Should Attend

Maintenance, application and support professionals.

Level II

Understanding the FANUC CO_2 Laser System

COURSE # TRLAS50-202 - 5 days

Description:
The FANUC CO_2 Laser maintenance course is developed for industry maintenance personnel to complete their understanding of FANUC CO_2 laser maintenance issues.

Topics covered in this course include:

- Theory and safety
- Daily inspection: laser gas specification, exhaust pump oil, turbo blower oil, laser output, cooling water
- Periodic maintenance: mirror cleaning, change and alignment; filter change; O-ring change; oil change
- Maintaining laser gas and laser cooling system
- Conducting an oscillator vacuum leakage test
- Performing laser oscillation to achieve discharge aging
- Checking the laser beam mode, optical axis adjustment and the oscillation characteristics and output
- Setting and adjustment: laser power supply, output coupler, rear and fold mirrors
- Troubleshooting: error messages and countermeasures; laser power supply; internal gas leakage; indication of state by means of self-diagnostic function

Course Benefits

At the conclusion of the course, students will have a complete understanding of the laser internal structure, operation and maintenance.

Prerequisites

Successful completion of the FANUC Usage & Maintenance course.

Who Should Attend

Factory maintenance professionals and laser machine operators.

eLearn Class Available!
Understanding the FANUC PMC System
COURSE #TRCOLM-298

FANUC Maintenance & Development Courses

Level II

Understanding the FANUC αi Servo System

COURSE # TRCNC40-295 - 4 days

Description:
This course explains in detail the hardware components that comprise the servo system, the parameters that control it and how to troubleshoot and resolve issues with motor vibrations, part shape deviations and surface finish quality. Suitable for maintenance, application and support professionals, this course provides a brief review of basic to intermediate operations and technology before focusing on advanced technical instruction.

Topics covered in this course include:

- Review of current and previous amplifiers, motors and pulse coder technology
- Servo software configuration and parameter interaction
- Setting of positioning parameters
- Backlash and pitch error compensation
- Parameter adjustment to improve part quality
- Machine vibration elimination functions
- Servo adjustment for part quality

Course Benefits

This course provides extensive hands-on exercises with simulation equipment. At the conclusion of this course, students will posess an expert level of application and maintenance knowledge.

Prerequisites

Successful completion of the FANUC Usage & Maintenance course.

Who Should Attend

Maintenance, application and support professionals.

eLearn Class Available!
Understanding the FANUC αi Servo System
COURSE #TRCOLM-295

Level III

Developing the PMC with FANUC Ladder-III

COURSE # TRCNC30-490 - 3 days

Description:
Building on knowledge acquired in the Understanding FANUC PMC System course, students in this advanced PMC class will utilize FANUC's development software to create a fully-functional ladder from scratch. Maintenance professionals and ladder developers/integrators alike will benefit from the topics covered. Using CNC Guide and Ladder-III, a sequence program controlling a machine's operator panel, motors and miscellaneous functions will be created while demonstrating nearly all of Ladder-III's functionality.

Topics covered in this course:

- Complete explanation and usage of FANUC Ladder-III
- Demonstration of advanced functional instructions not covered in our Understanding FANUC PMC System course
- Multi-path programming and conversion of ladders to different CNC types
- Using of CNC Guide as a rapid testing and development tool
- Introduction to function block and step sequence programming

Course Benefits

This course provides extensive hands-on usage of FANUC Ladder-III. At the conclusion of the course, students will possess expert-level application and maintenance knowledge in the areas of controlling PMC logic flow, subprograms, function block programming and Ladder-III.

Prerequisites

Successful completion of the Understanding the FANUC PMC System course.

Who Should Attend

Maintenance, support and application professionals.

FANUC Maintenance & Development Courses

Level III

Motor Tuning with FANUC Servo Guide

COURSE # TRCNC30-496 - 3 Days

Description:
This course covers initial setup of Servo and Spindle Motors, the verification of operation and the process of ensuring accurate motor usage. Students will set initial Servo and Spindle parameters and by the use of FANUC Servo Guide, the students will tune the motors to perform optimally. This course is designed for machine tool builders and integrators, and provides in depth usage of FANUC Servo Guide for initial setup and tuning.

Topics covered in this course include:
- Initial setup of Servo and Spindle Motor parameters
- Initial setup of FANUC Servo Guide software
- Utilization of FANUC Servo Guide features
- Tuning of FANUC Servo and Spindle Motors

Course Benefits
This course provides extensive hands-on usage of FANUC Servo Guide on simulators and on machine tools. At the conclusion of this course, students will possess an expert level of knowledge on the utilization of FANUC Servo Guide.

Prerequisites
Successful completion of Understanding the FANUC α*i* Servo System, as well as the ability to purchase FANUC Servo Guide software.

Who Should Attend
Machine tool builders and integrators.

Level III

Developing the HMI with FANUC Picture

COURSE # TRCNC30-491 - 3 days

Description:

This course will expose students to the features of FANUC's custom CNC screen design software: FANUC Picture. Whether you need to create or modify a single CNC screen, or develop an entire Human-Machine Interface (HMI), this course is what you've been looking for. Using CNC Guide as a testing environment, each student will create several custom screens that utilize each of FANUC Picture's many tools, culminating in the creation of an HMI that replaces the physical operator panel with on-screen functions.

Topics covered in this course include:
- Setting up CNC Guide to work with FANUC Picture
- Explanation and usage of each FANUC Picture screen design tool
- Introduction to FANUC Picture Scripting (similar to Custom Macro)
- Design guidance on duplicating the CNC's soft key layouts
- How to reverse-engineer a previously completed FANUC Picture project

Course Benefits
At the conclusion of this course, students will be able to design and develop custom CNC screens to meet individual machine and process requirements.

Prerequisites
Successful completion of FANUC Usage & Maintenance course is required; completion of the Understanding the FANUC PMC System course is preferred.

Who Should Attend
Machine tool builders, OEMs, retrofitters and integrators who want to enhance their machine tool applications.

eLearn Class Available!
Developing the HMI with FANUC Picture
COURSE #TRCOLI-491

Level III

FANUC Robot and Machine Tool Integration

COURSE # TRRMT40-701 – 4 Days

Description:
This course explains the concepts involved in creating a work cell, defining the cell, making the necessary modifications to settings in the Robot, as well as the required modifications to settings and PMC Ladder logic in the CNC. Topics covered also include teaching frames and programs on the Robot, creating and utilizing M-codes for operating the Robot within the G-code program on the CNC, as well as operation of the Robot from the CNC operator panel and operation of the CNC from the Robot iPendant. This class will utilize the Robot Connection Function on the CNC side (available on FANUC 0*i* Model D and newer controls) and Machine Tool Easy Setup option for the Robot (available on R-30*i*A and newer Robot controls). These functions are used in this class because they give the student the opportunity to learn the underlying concepts involved in the integration process. These concepts have been incorporated in newer features such as Robot Connection Function II (for FANUC ROBODRILL) and QSSR (Quick and Simple Startup of Robotization).

Course Benefits

This course is intended to provide attending students with the fundamental concepts and knowledge required to perform an integration of a FANUC robot and a FANUC CNC. The course will have students create a viable work cell, to understand the software, hardware and programming required to make a work cell that is fully functional.

Prerequisites

HandlingTool Operation & Programming and Understanding the FANUC PMC System.

Who Should Attend

This course is intended for integrators, maintenance and application support personnel.

Contact Us

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www.FANUCAmerica.com/CNCTraining

FANUC Programming Courses

Level I

MANUAL GUIDE *i* Programming

Mill COURSE # TRCNC20-322 - 2 days
Lathe COURSE # TRCNC20-323 - 2 days

Description:
MANUAL GUIDE *i* is an on-screen programming tool for machining centers and lathes that allows the skilled machinist to easily create, edit and simulate the part program through a single integrated display. With MANUAL GUIDE *i*, the user can perform most operations from one screen that allows them to develop anything from a simple bolt hole pattern to a complex machined part. Two courses are offered - milling and turning. Each course will cover basic MANUAL GUIDE *i* configuration and part program development.

Topics covered in these courses include:

- Screen navigation
- Conversational part program development
- Development and use of fixed form sentences and tool data
- Machining simulation (animated drawing)

Course Benefits

At the conclusion of each course, students will be able to develop entire part programs and configure tool data within MANUAL GUIDE *i*.

Prerequisites

Basic G-code programming and knowledge of materials and tooling.

Who Should Attend

Experienced programmers and machinists who wish to learn how to use MANUAL GUIDE *i* conversational programming or develop a better understanding of conversational programming software.

Student Feedback:
"Great class and instructor. I can't wait to come back"
- Michael A.
Level I Programming Course

Level II

G-Code Programming & Operation

COURSE # TRCNC40-396 - 4 days

Description:

The FANUC G-Code Programming & Operation course explores the fundamentals of G-code programming for milling and turning applications. After learning the purpose of various G-codes, students will create several programs to test their understanding.

Topics covered in this course include:

- Navigation and control features
- Basic positioning and cutting commands
- Work and tool offsets
- Canned cycles including multiple repetitive cycle commands

Course Benefits

At the conclusion of the course, students will have an understanding of G-codes used in machining and turning and will have written several programs for both mills and lathes.

Prerequisites

A passing score on the eLearn FANUC Foundations assessment test or successful completion of the FANUC Usage & Maintenance course

Who Should Attend

Programmers of any experience level who wish to develop a better understanding of G-code programming.

Level II

FANUC Setup, Programming & Machining

COURSE #TRCNC40-301 - 4 days

Description:
This course teaches a full range of skills necessary to produce parts on a CNC machining center: verifying the workholding equipment is ready, setting the work coordinate and tool offsets, calculating feeds and speeds, writing the part program, machining the part and then optimizing the program for the shortest cycle time. Over the course of four days students will learn to design a part using several processes from engineering drawings, set it up and machine it on a FANUC ROBODRILL. Using a mix of 3D machine visualization and hands-on machine time students will study most G-codes used in standard machining – from G0 to G99. For students who use CAM to create part programs, this course will help them understand the program the post processor creates and how to fine tune it. There is a one-day course extension focusing on ROBODRILL Guide Server features. (See page 11.)

Course Benefits
After of the course, students will know how to set up a machining center, understand G-codes used for machining, know how to write and debug programs, machine a part they programmed and gain strategies for optimizing a program's operation.

Prerequisites
Successful completion of the FANUC eLearn Usage & Operations course or equivalent experience.

Who Should Attend
Programmers of any experience level who wish to develop a better understanding of G-code programming. Anyone looking to make the transition from manual to CNC machining or those wanting to become more familiar with the setup and use of a CNC milling machine. Anyone looking to see how machine visualization software can speed up the part development cycle by verifying processes without tying up valuable machine time. Manufacturing and process engineers looking to gain a better understanding of the complete machining process.

eLearn Class Available!
Machining Center Programming, Setup and Operation
COURSE #TRCOLP-312

Level II

FANUC Setup, Programming & Turning

COURSE #TRCNC40-302 - 4 days

Description:
This course teaches a full range of the skills required to produce parts on a CNC turning center, including: verifying the workholding equipment is ready, setting the work shift and tool offsets, calculating feeds and speeds, writing the part program, turning the part, and optimizing the program to achieve the shortest cycle time. During the four-day course, students will design several parts using engineering drawings and then set up and turn one on a FANUC-controlled lathe. Using a mix of 3D machine visualization and hands-on machine time, students will be exposed to most of the G-codes used in standard turning – from G0 to G99. This course will help students who use CAM to create part programs to understand the program the post processor creates and how to fine tune it.

Course Benefits
After the course, students will know how to set up a turning center, understand G-codes used for turning, know how to write and debug programs; turn a part they programmed and gain strategies for optimizing a program's operation.

Prerequisites
Successful completion of the FANUC eLearn Usage & Operations course or equivalent experience.

Who Should Attend
Programmers of any experience level who wish to develop a better understanding of G-code programming. Machinists looking to make the transition from manual to CNC turning or those wanting to become more familiar with the setup and use of a CNC turning machine. Anyone looking to see how machine visualization software can speed up the part development cycle by verifying processes without tying up valuable machine time. Manufacturing and process engineers looking to gain a better understanding of the complete turning process.

eLearn Class Available!
Turning Center Programming, Setup and Operation
COURSE #TRCOLP-313

FANUC Programming Courses

Level III

Custom Macro Programming

COURSE # TRCNC40-391 - 4 days

Description:
The Custom Macro Programming course provides practical instruction in the development and troubleshooting of macro programs. The fourth day provides enhanced troubleshooting scenarios and programming exercises.

Topics covered in this course include:

- Macro programming features of new control models
- Local, common and system variables
- Macro arithmetic commands
- Decisions and loops
- External output commands
- Interfacing macro commands with physical I/O

Course Benefits

At the conclusion of the course, students will be able to develop Custom Macro programs to reduce cycle times, increase automation and improve efficiency of programming. They will also be able to read, troubleshoot and simplify existing programs.

Prerequisites

Successful completion of a Level II programming course.

Who Should Attend

Experienced G-code programmers who wish to learn how to write programs that accomplish tasks beyond the limitations of G-code.

Student Feedback:
"I learned a good deal of new or more detailed information even though I have macro programming experience."
- Glenn H.
Level III Programming Course

eLearn Class Available!
FANUC Custom Macro Programming
COURSE #TRCOLP-391

Level III

Understanding FANUC 4- and 5-Axis Functions

COURSE # TRCNC30-351 - 3 days

Description:
5-axis machining offers many advantages compared to conventional 3-axis machining: decreased fixturing; increased accuracy and surface quality; increased tool life; and reduced cycle time to name a few. This course explains advanced machining functions used for 3+1 (4-axis) and 3+2 (5-axis) indexing, full 5-axis simultaneous machining, high-performance machining and high-quality surface finishes. The class culminates in students using 5-axis machining to produce a part they can take home with them. For those tasked with maintaining or supporting the machines these functions are used on, we offer an additional day of instruction to cover alarms, troubleshooting and calibration. (See page 7.)

Course Benefits

After the course, students will be familiar with the operation screens; understand multi-axis index and 5-axis compensation functions and know how to use advanced functions to make better parts.

Prerequisites

Successful completion of G-Code Programming and Operation or FANUC Setup, Programming and Machining.

Who Should Attend

Anyone who uses or supports 4- and 5-axis machining: machining, programming, maintenance and application support personnel. Attendees must be legal United States residents.

Level II

FANUC Setup, Programming and Machining: ROBODRILL Addition

COURSE # TRRBD10-303 - 1 day

Description:
This optional one-day course is an extension to the FANUC Setup, Programming and Machining course. The course covers the program-related screens and functions of the ROBODRILL Quick Screen feature. Students will gain hands-on experience with coordinate system and tool compensation setup, parts and tool use counting, precision and quality settings, and many other features. NOTE: This class will be scheduled to immediately follow our FANUC Setup, Programming and Machining course. (See page 9.)

Topics covered in this course include:

- Set up tools and enter correct data in offsets
- Program simple geometric shapes
- Drill and tap simple holes
- Navigate the control menus
- Manually position and reference the machine
- Download/upload programs to USB

Course Benefits

Students will gain an understanding of the many program-related features provided by the ROBODRILL's Quick Screen feature.

Prerequisites

Successful completion of FANUC Setup, Programming and Machining course.

Who Should Attend

Anyone who uses a FANUC ROBODRILL for machining.

Level II

Understanding the FANUC ROBODRILL

COURSE # TRRBD40-501 - 4 days

Description:
This course is designed to teach basic troubleshooting and maintenance on the ROBODRILL machine. Recommended safety procedures are integrated into all training exercises. In addition to lab exercises, a pretest and posttest are used to measure mastery of objectives.

Topics covered in this course include:

- Set up tools and enter correct data in offsets
- Use QUICK/NC maintenance and troubleshooting menus
- Manually position and reference the machine
- Download/upload programs to USB
- Perform basic maintenance procedures
- Understand the basic maintenance of the machine
- Read the pneumatic diagram
- Troubleshoot alarms and diagnostics

Course Benefits

After the course, students will have gained an understanding of the many features and processes used to troubleshoot and maintain the FANUC ROBODRILL.

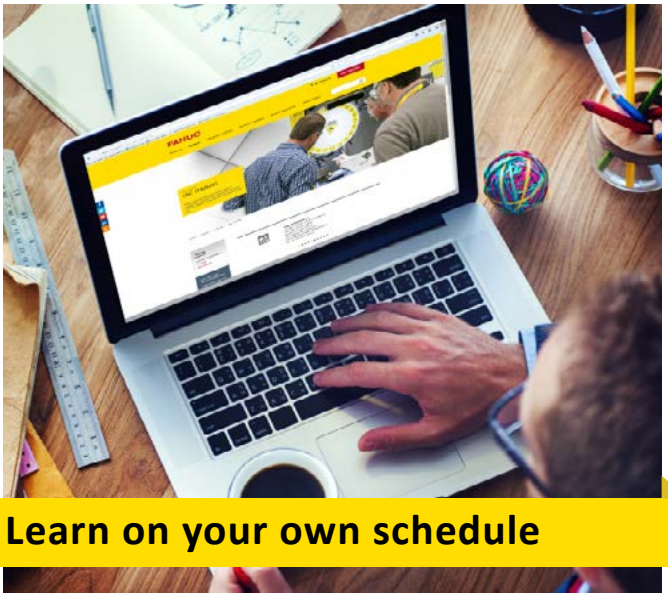
Prerequisites

Successful completion of FANUC Usage & Maintenance course.

Who Should Attend

This course is intended for maintenance personnel or supervisors who need to be aware of basic troubleshooting and maintenance procedures for the ROBODRILL machine.

FANUC eLearn Training



Learn on your own schedule

Learn FANUC CNC programming, operation and maintenance at your own pace and on your own schedule. FANUC eLearn courses include presentations, quizzes and exercises, as well as support from an eLearn instructor. Exercises are performed on FANUC CNC Guide Simulation Software running on a PC. Most courses require a license for CNC Guide which can be purchased with class registration - part number A08B-9010-J752#ZZ12.

For more information and complete list of course descriptions and prerequisites visit www.FANUCAmerica.com/CNCTraining

FANUC Foundations

COURSE # TRCOLP-102 - 0.75 hour

Description:
Firm up your understanding of the FANUC organization and FANUC CNCs at no charge with this free, high-level introduction to machining.

With a run time of less than 40 minutes, this is a beneficial course to give students a solid foundation on which to build the rest of their educational experience.

Topics covered in this course include:

- Basic machine configurations
- The system block diagram
- Control components
- Basic screen navigation
- Overview of the FANUC organization.

Prerequisites

None.

Requirements

Internet connection and a PC or tablet device.

Who Should Attend

Anyone interested in eLearn or classroom training from FANUC America.

To take the course, simply click on the following link or copy and paste the URL into your favorite browser **https://training.FANUCAmerica.com/FANUC_foundations/**
No login or payment information needed. If you are taking this course as a prerequisite for our Level II Programming courses, please email or call to get access to the associated assessment test.

FANUC CNC Usage & Maintenance

COURSE # TRCOLM-501 - 25 hours

Description:
This eLearn course focuses on the fundamentals of CNCs and factory automation. This course provides an excellent foundation and ensures students will have the necessary background knowledge before they take higher level courses. We recommend that anyone who has not attended Usage & Maintenance or a similar introduction/ refresher course in the past two years complete this course prior to taking any higher level courses.

Topics covered in this course include:

- CNC screens and their purpose
- Memory backup and restoration
- CNC, servo and spindle system hardware
- Common alarms and troubleshooting
- Troubleshooting CNC alarms and general system failures
- Ladder logic and troubleshooting machine alarms and M-codes
- Introduction to G-code, part program structure and alarms

Prerequisites

None.

Requirements

Internet connection and a PC or tablet device.

Who Should Attend

The course material is suitable for students of all experience levels who work with FANUC CNCs in a variety of roles, including operators, maintenance professionals, supervisors and engineers.

Classroom Version Also Available!
FANUC Usage & Maintenance
COURSE #TRCNC40-501

Understanding the FANUC PMC System

COURSE # TRCOLM-298 - 30 hours

Description:
The Programmable Machine Control (PMC) system is the interface between the FANUC CNC and the machine tool. This course will help you understand how the PMC system works by explaining the Input/Output hardware, software screens, digital signals and functional instructions that are used in the PMC. Understanding how each piece in the ladder works is key to being able to develop your own, as well as performing maintenance or debugging. Troubleshooting tools and maintenance procedures are covered to help students understand and eliminate machine-side electrical interface troubles. An introduction to ladder editing and development is also provided. This course is suitable for maintenance, application and support professionals.

Topics covered in this course include:

- PMC screen navigation
- Ladder and PMC parameter back-up and restoration
- Advanced contact and coil logic
- Complete sub-function explanations
- Comparison of PMC software types and hardware models
- Machine tool builder alarm/message and PMC system alarm troubleshooting
- Introduction to ladder editing and development

Prerequisites

Successful completion of the FANUC Usage & Maintenance course.

Requirements

Internet connection and a PC or tablet device.

Who Should Attend

Maintenance, application and support professionals.

Classroom Version Also Available!
Understanding the FANUC PMC System
COURSE #TRCNC40-298

Understanding the FANUC αi Servo System

COURSE # TRCOLM-295 - 20 hours

Description:
This course explains in detail the hardware components that comprise the servo system, the parameters that control it, and how to troubleshoot and resolve issues with motor vibrations, part shape deviations and surface finish quality. Suitable for maintenance, application and support professionals, this course provides a brief review of basic to intermediate operations and technology before focusing on advanced technical instruction.

Topics covered in this course include:

- Review of current and previous amplifiers, motors and pulse coder technology
- Servo software configuration and parameter interaction
- Setting of positioning parameters
- Backlash and pitch error compensation
- Parameter adjustment to improve part quality
- Machine vibration elimination functions
- Servo adjustment for part quality

Prerequisites

Successful completion of the FANUC Usage & Maintenance course.

Requirements

Internet connection and a PC or tablet device. CNC Guide is recommended, but not required for this course. CNC Guide not included.

Who Should Attend

The course material is suitable for students of all experience levels who work with FANUC CNCs in a variety of roles, including operators, maintenance professionals, supervisors and engineers.

Classroom Version Also Available!
Understanding the FANUC αi Servo System
COURSE #TRCNC40-295

FANUC CNC Usage & Operations

COURSE # TRCOLP-131 - 7.5 hours

Description:
FANUC CNC Usage and Operations course explores the fundamentals of CNC uses, configurations, and operations for the FANUC 30i/31i/32i Model B and 0i-F controls. Provides in-depth definitions and explanations of the FANUC CNC screens, keyboard functions, machine operator panel switches and basic G-code programming concepts. To further enhance each student's learning experience, use of CNC Guide is recommended for enhanced screen navigation, testing functions and CNC programs creation and debugging.

Prerequisites

None.

Requirements

Internet connection and a PC or tablet device.

Who Should Attend

Anyone interested in the basic operations and concepts of FANUC CNCs.

FANUC G-Code Programming — Mill

COURSE # TRCOLP-332 – 30 hours

Description:
This Milling G-Code programming and operation course explores the fundamentals of mill G-code programming for the FANUC 30*i*/31*i*/32*i* Model B and 0*i*-F controls. To further enhance each student's learning experience, use of CNC Guide is recommend for developing, testing and debugging CNC programs.

Topics covered in this course include:

- Navigation and control features
- Basic positioning and cutting commands
- Work and tool offsets
- Canned cycles

Course Benefits

At the conclusion of the course, students will have an understanding of the G-codes used in machining and will have written and tested multiple programs for milling machines.

Prerequisites

Successful completion of the FANUC CNC Usage & Operations or FANUC CNC Usage & Maintenance course.

Requirements

Internet connection and a PC or tablet device. CNC Guide is recommended but not required for this course. CNC Guide is not included.

Who Should Attend

Programmers and operators who wish to develop a better understanding of mill G-code programming.

FANUC G-Code Programming — Lathe

COURSE # TRCOLP-333 – 30 hours

Description:
This Lathe G-code programming and operation course explores the fundamentals of turning G-code programming for the FANUC 30*i*/31*i*/32*i* Model B and 0*i*-F controls. To further enhance each student's learning experience, use of CNC Guide is recommend for developing, testing and debugging CNC programs.

Topics covered in this course include:

- Navigation and control features
- Basic positioning and cutting commands
- Work and tool offsets
- Canned cycles

Course Benefits

At the conclusion of the course, students will have an understanding of G-codes used in turning and will have written and tested multiple programs for lathes.

Prerequisites

Successful completion of the FANUC CNC Usage & Operations or FANUC CNC Usage & Maintenance course.

Requirements

Internet connection and a PC or tablet device. CNC Guide is recommended but not required for this course. CNC Guide is not included.

Who Should Attend

Programmers and operators who wish to develop a better understanding of lathe G-code programming.

Contact Us

For questions call FANUC America technical training at 888-FANUC-US (888-326-8287) select 2➔4, or go to **www.FANUCAmerica.com/CNCTraining**

FANUC eLearn Training

FANUC Custom Macro Programming

COURSE # TRCOLP-335 - 20 hours

Description:
Master custom macro programming for CNC machining and turning centers. Custom macro provides users countless benefits. Just about every facet of a CNC environment can be enhanced by incorporating methods afforded by custom macro. Students learn the benefits of custom macro application and how to implement improvements when applications are found.

Prerequisites
Basic understanding of machining practices and a general understanding of G-code programming.

Requirements
Internet connection and a PC or tablet device.

Who Should Attend
Machine operators with a general understanding of G-code level programming as it applies to CNC machining centers and turning centers.

CNC Integrator Basic Training

COURSE # TRCOLI-412 - 20 hours

Description:
This course is for machine tool builders and integrators who want to learn how to get the most out of FANUC CNCs and improve their knowledge and skills when it comes to setting up and programming CNCs and servo motors. This course covers basic CNC, CNC Guide and Ladder-III software, servo and spindle set up and system backup and restore.

Prerequisites
Students should have some experience and familiarity with integrating FANUC CNCs and access to a CNC system for some sections of the course.

Requirements
Internet connection and a PC or tablet device with access to the full versions of CNC Guide and Ladder-III software.

Who Should Attend
Machine tool builders and integrators.

Classroom Version Also Available!
Custom Macro Programming
COURSE #TRCNC40-391

Dual Check Safety Principles

COURSE # TRCOLI - 421 - 4 hours

Description:
Dual Check Safety is FANUC's implementation of a Category 3 safety system and offers a high level of safety through redundant monitoring and duplicate paths of breaking power to the servo/spindle amplifier. This eLearn presentation provides an overview of the four main safety principles that Dual Check Safety operates by, including dual channels of safe I/O, redundant cut-off of motor power, dual monitoring of safe I/O, and dual monitoring of servo and spindle motors.

Prerequisites
None.

Requirements
Internet connection and a PC or tablet device.

Who Should Attend
Engineers who are designing with Dual Check Safety in mind and maintenance professionals who need to understand how it is implemented.

Developing the HMI with FANUC Picture

COURSE # TRCOLI-491 - 20 hours

Description:
This course will expose students to the features of FANUC's custom CNC screen design software: FANUC Picture. Whether you need to create or modify a single CNC screen, or develop an entire Human-Machine Interface (HMI), this course is what you've been looking for. Using CNC Guide as a testing environment, each student will create several custom screens that use each of FANUC Picture's many tools, culminating in the creation of an HMI that replaces the physical operator panel with on-screen functions.

Topics covered in this course include:

- Setting up CNC Guide to work with FANUC Picture
- Explanation and usage of each FANUC Picture screen design tool
- Introduction to FANUC Picture Scripting (similar to Custom Macro)
- Design guidance on duplicating the CNC's soft key layouts
- How to reverse-engineer a previously completed FANUC Picture project

Prerequisites
Completion of FANUC Foundations or FANUC CNC Usage & Maintenance course is required; completion of the Understanding the FANUC PMC System course is preferred.

Requirements
Internet connection, a PC or tablet device, CNC Guide and FANUC Picture software (CNC Guide and FANUC Picture not included in cost of course).

Who Should Attend
Machine tool builders, OEMs, retrofitters and integrators who want to enhance their machine tool applications.

Classroom Version Also Available!
Developing the HMI with FANUC Picture
COURSE #TRCNC30-491

Contact Us

For questions call FANUC America technical training at 888-FANUC-US (888-326-8287) select 2➔4, or go to www.FANUCAmerica.com/CNCTraining.

eLearning for Education Students

Machining Center Programming, Setup and Operation

COURSE # TRCOLP-312 - 30 hours

Turning Center Programming, Setup and Operation

COURSE # TRCOLP-313 - 30 hours

Description:
Learn what it takes to program, setup and run a machining or turning center with a FANUC CNC. Each lesson builds upon prior material. Upon completion, graduates will be fully capable of operating a turning or milling CNC center.

Prerequisites
Basic understanding of machining practices.

Requirements
Internet connection and a PC or tablet device.

Who Should Attend
Mill or lathe operators with a basic understanding of machining practices as well as a familiarity with various cutting tools.

Classroom Versions Also Available!
Machining Center Programming,
Setup and Operation
COURSE #TRCNC40-301
Turning Center Programming,
Setup and Operation
COURSE #TRCNC40-302

FANUC Maintenance Certification

FANUC America now offers two CNC certification programs that affirms the student has successfully completed rigorous classroom instruction. Employers can be confident in their employees' knowledge and abilities.

FANUC Maintenance Professional Certification

This certification identifies individuals who are prepared to successfully mitigate a wide range of CNC operating challenges, including system failures. Students who have completed FANUC Usage & Maintenance, Intensive Maintenance and Understanding the FANUC PMC System courses can receive certification as a FANUC Maintenance Professional. Students will receive a special certificate and are authorized to use the FANUC Maintenance Professional designation.

FANUC Maintenance Master Certification

Students with FANUC Maintenance Professional certification can continue their studies and earn FANUC Maintenance Master Certification. To achieve this advanced-level recognition, students must complete Understanding the FANUC αi Servo System, Developing the PMC with FANUC Ladder-III and FANUC Custom Macro Programming and/or Motor Tuning with FANUC Servo Guide courses. Students must complete FANUC Maintenance Professional Certification in order to receive FANUC Maintenance Master Certification.

FANUC America recognizes the benefits and advantages of the personal interaction and instruction that takes place in our instructor led classes. FANUC holds the maintenance certification program to the highest standards and requires students to attend instructor led classes in order to qualify for the Maintenance Certifications. Take advantage of special package pricing by purchasing all the required courses and completing them within a two-year time frame.

For courses purchased as a package, if all courses are not completed within the two-year time frame, refunds are available for the purchase price less the full cost of the completed courses. All registered courses are subject to the standard FANUC CNC Training terms and conditions.

For more information please visit
www.fanucamerica.com/support/training/cnc-robodrill/cnc-maintenance-certifications

Improve Hands-On Training & Troubleshooting Skills

FANUC CNC Simulator

The FANUC CNC Simulator brings the world's most popular CNC right into the classroom or training room to provide students with exposure to FANUC controls without the need for a full machine. The FANUC CNC Simulator is based on the FANUC Series 0*i* – MODEL F platform and can be started up in either milling or turning configurations.

The Simulator is an actual FANUC CNC, so students will become familiar with the look, feel, function and layout of the control as they navigate and program a fully operational CNC. FANUC's MANUAL GUIDE *i* conversational programming interface allows users to graphically generate programs that can be simulated in 3D, prior to being converted back to conventional NC programs and used on machine tools using FANUC controls. Uploading and downloading (read and punch) functions use a Flash ATA interface and USB interface. DNC functions are supported by Ethernet and a Flash ATA card.

FANUC Machining Simulator

The FANUC Machining Simulator encompasses the complete manufacturing process from part design and engineering to CNC programming to virtual production simulation. The FANUC Machining Simulator features Autodesk Fusion 360 CAD/CAM/CAE software and a custom machining simulation program. Students can perform CAD/CAM work and the included post processors will convert the designs into G-code suitable for the CNC. The FANUC CNC uses this G-code to command the machine tool. The simulation system also includes a simple G-code editor for making modifications before the program is sent to the CNC. Students can easily import their programs directly to the CNC using the FANUC FASBacCNC user interface and also back-up the critical CNC data.

Machining Simulation

With the machining simulation component, users can virtually manufacture parts in milling or turning environments with realistic kinematics and structure. The simulation is based on actual CNC position data, not on the G-code program, so the virtual machine reacts exactly like a real machine tool. Color-coded tool paths, back-plot and cut locations make it easy for users to identify the tool, path and cutting result. Real-time collision detection uses visual and audio signals to notify users of collisions.

CNC Simulator
Part Number: A02B-0158-B100#US

CNC Machining Simulator
Part Number: D73F-0320-PB00

Please visit **http://www.FANUCAmerica.com/products/CNC/FANUC-simulators** for more information and pricing.

FANUC America Corporation - FANUC CNC training course registration and facility information

Registration information:

- You are not officially enrolled for the course until you receive confirmation from FANUC America Corporation - FANUC CNC (FAC - FANUC CNC).
- Non–U.S. Citizens: Due to United States export regulations, additional documentation is required for non-U.S. citizens to attend training courses. Please call (888–326-8287) for details.

Course pricing, payments and cancellation:

- FAC - FANUC CNC reserves the right to cancel a course at any time and is not responsible for non-refundable travel arrangements.
- Cancellation of course registration is done at no charge if FAC - FANUC CNC is notified in writing with a minimum of 7 business days' advance notice.
- Cancellation of course registration with less than 7 business days' advance notice will be charged for the course and may be rescheduled. Attendance must be within 6 months of the original course date.
- The full fee will be charged for students who fail to attend the course without notice.
- FAC - FANUC CNC reserves the right to cancel, postpone, or otherwise delay training due to circumstances beyond its control.
- The prices quoted for training courses are valid for 30 days and thereafter, such prices are subject to change without notice. Prices quoted do not include sales, use or excise taxes or duties unless expressly noted, and are the responsibility of the Purchaser. Any taxes or duties paid on the Purchaser's behalf by FAC - FANUC CNC will be invoiced back to the Purchaser with payment terms of net 30 days and a 1% service charge per month for late charges.

**NOTE: All costs incurred for customer on-site training cancellation will be billed to the customer.

Course details:

- Course Hours: Courses meet from 8:30 a.m. – 4:30 p.m., with a one-hour lunch break. Students may gain admission to the FAC - FANUC CNC building starting at 8:00 a.m. each day.
- Meals: Lunch will be provided each day during the training session. Breakfast, dinner and snacks are the responsibility of the student. Restaurants are located within a few minutes of the FAC - FANUC CNC facility.

Facility requirements:

- Students at the FAC - FANUC CNC Training Center may utilize the lunchroom refrigerator, ice maker and vending machines. In-class Wi-Fi is available for students who wish to access the Internet during class breaks.
- FAC - FANUC CNC is a non-smoking facility.
  - » Smoking is allowed outside of the first floor, South entrance only, no closer than 15 feet from the building.
  - » Smoking is not allowed outside of the main entrance.
- It is the policy of FAC - FANUC CNC that the use, sale, transfer or possession of alcohol or drugs on FAC - FANUC CNC premises, vehicles, work sites or in any private vehicles parked on FAC - FANUC CNC property is prohibited. FAC - FANUC CNC strictly prohibits any individuals from attending any training session while under the influence of alcohol or drugs. If a FAC - FANUC CNC instructor determines that an individual is attending a training session while under the influence of alcohol or drugs, the individual will no longer be permitted to attend the remainder of the training session.
- FAC - FANUC CNC reserves the right, when deemed necessary by management, for authorized persons to search and inspect the property and personal items of visitors or students, including vehicles, brought onto company property in order to prevent workplace violence or theft. There should be no assumption to the right of privacy in cases regarding the protection of FAC - FANUC CNC assets or the safety of employees and guests.
- Threats, intimidating behavior or any other acts of aggression or violence in the workplace, including the possession of weapons, are not tolerated. Visitors or students engaged in violent acts on company property or against employees on the job are reported to the appropriate authorities for possible criminal or civil prosecution.

Cameras and recording: FAC - FANUC CNC prohibits the use of cameras or any other recording devices (camera phones, videotapes, etc.) in the training rooms and facility in general.

Attire: Business casual attire is required at all training sessions. No shorts, sleeveless shirts, or sandals are permitted in any training session. Students who attend a training session with inappropriate attire will be asked to leave the training session.

While on site:

- Students are to park in "student" designated parking only.
- Only the Main entrance will be used whenever students are entering or leaving the building.
- Each student will be given a visitor badge each morning, to be returned at the end of each day. While on site, students are required to wear their visitor badge and have it clearly visible at all times.
- Unless accompanied by an escort, the second floor and warehouse areas are restricted.

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