



TECHNICAL TRAINING & SUPPORT SERVICES

for Manufacturing and Industrial Automation



**ELECTRICAL AND
MECHANICAL**

**DRIVES AND MOTOR
CONTROL**

INSTRUMENTATION

**MAINTENANCE, RELIABILITY,
AND TROUBLESHOOTING**

PLCs AND HMI

PROCESSES AND SYSTEMS

**NFPA 70E ARC FLASH
ASSESSMENTS AND LABELING**

CAD DRAWING SERVICES

**PROCEDURE REVIEW AND
DEVELOPMENT**

SAFETY AUDITS AND TRAINING

STAFFING SOLUTIONS

TESTING AND PROCTORING

WORKFORCE UPSKILLING

Upskill your staff with a hands-on, practical approach to training!

PURCHASE COURSES ONLINE AT [CROWNTRAINING.COM](https://crowntraining.com)

2642 E. 84TH PLACE | MERRILLVILLE, IN | 219-947-0845 | [INFO@CROWNTRAINING.COM](mailto:info@crowntraining.com)



Table of Contents

Our Services	3
Documentation and CAD Services	3
Inventory Parts Management	3
NFPA 70E Arc Flash Assessments/Labeling	4
Preventive/Predictive Maintenance Services	4
Bulwark and Red Kap Industrial Apparel.....	4
Safety Program Assistance	4
Technical Staffing and Field Support.....	5
Technical Training	5
Advantages	6
Customer Benefits	6
Experienced Staff	6
Facilities and Equipment.....	6
Flexibility	6
Hands-on and Practical	6
Hardware and Software Expertise	6
Satisfied Customers	7
Testimonials	7
Experience and Industries Served	8
Automotive	8
Biotechnology	8
Consumer Products	8
Food	8
Industrial Gases & Chemicals	9
Material Handling	9
Metals	9
Packaging	9
Petroleum & Pipeline	10
Pharmaceutical	10
Transportation	10
Utilities	10
Training Options	11
Catalog Courses	11
Mentoring	11
On-Site Training.....	11
Customized Training.....	11
Catalog Courses	12
Computer Aided Design (CAD).....	12
Basic AutoCAD:.....	12
Drives	12
Allen-Bradley PowerFlex AC Drive:	12
Allen-Bradley PowerFlex DC Drive:	12
Siemens 6RA70 Drive:	13
Siemens 6RA80 Drive:	13
Electrical.....	14
AC Crane Control:	14
Basic Industrial Electricity:.....	14
Electrical Control Circuits and Troubleshooting:	14
Motor Maintenance and Troubleshooting:.....	14
Reading Electrical Drawings:	15
Switchgear Breaker Safety and Maintenance:	15
Human Machine Interface (HMI)	16
Allen-Bradley Basic FactoryTalk View ME	16
GE Fanuc Basic Proficy HMI/SCADA Cimplicity:.....	16
GE Fanuc Basic Proficy HMI/SCADA iFix:.....	16
Instrumentation.....	17
Basic Instrumentation:.....	17



Table of Contents

Troubleshooting and Applied Instrumentation:	17
Piping and Instrument Diagram (P&ID) Print Reading and Red-Lining:	17
Scales:	17
Tuning PID Loops:	17
Maintenance	18
Basic Preventive and Predictive Maintenance:	18
Basic Troubleshooting Skills:	18
Industrial Maintenance Planning and Scheduling:	18
Introduction to Reliability Centered Maintenance (RCM):	18
Introduction to Vibration Measurement and Analysis:	19
NFPA 70B Standard for Electrical Equipment Maintenance:	19
Outage Planning, Plant Shutdowns, and Turnarounds:	19
Root Cause Failure Analysis and Problem Solving Tools:	19
Mechanical	20
Basic Hydraulics and Pneumatics:	20
Basic Machine Alignment:	20
Fans, Blowers, and Compressors:	20
Mechanical Fasteners:	20
Power Transmission:	21
Pumps, Packing, and Seals:	21
Reading Mechanical Drawings:	21
Valves and Valve Actuators:	21
Process Lines and Facilities	22
Process Line Fundamentals and Tension Analysis:	22
Programmable Logic Controllers	23
Basic ControlLogix Maintenance and Troubleshooting:	23
Advanced ControlLogix Maintenance and Troubleshooting:	23
GE Fanuc Basic PACSystems RX3i:	23
GE Fanuc Advanced PACSystems RX3i:	23
SAFETY	24
First Aid, CPR, and AED:	24
General Industrial Safety:	24
NFPA 70E Standard for Electrical Safety in the Workplace:	24
Electrical Maintenance Program	25
Mechanical Maintenance Program	31
Course Registration Form	36
Driving Directions	37
Lodging Options:	37
Map	38



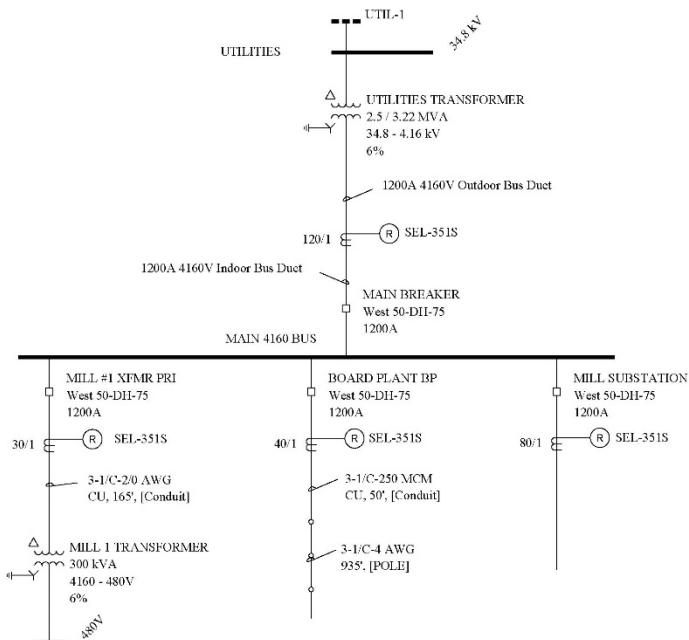
Our Services

Crown Training & Development (CT&D) is a technical training and support services company for industrial processes and manufacturers. CT&D was established in September of 1999 and is located in Merrillville, Indiana. Our company provides the following services that can help you achieve your goals.

Documentation and CAD Services

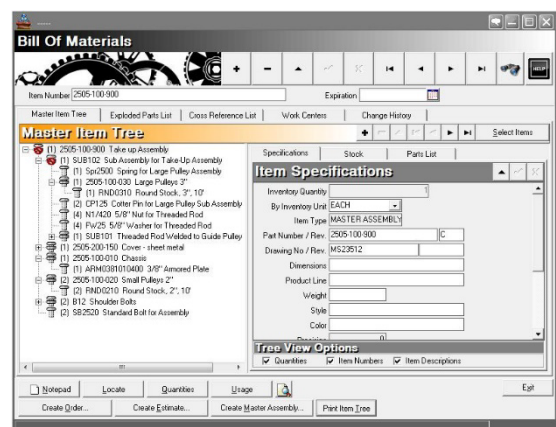
Develop, review, or update your existing:

- ECPs
- Electrical Drawings
- LOTOs
- Maintenance Manuals
- One-line Diagrams
- P&IDs
- SJPs
- SOPs
- Training Manuals
- Troubleshooting Guides



Inventory Parts Management

- Map and Label Storage Areas
- Locate, Verify, Count, and Tag Inventory Items
- Bin Organization
- BOM Assistance
- Update Data into Management System
- Relocate Items as Required



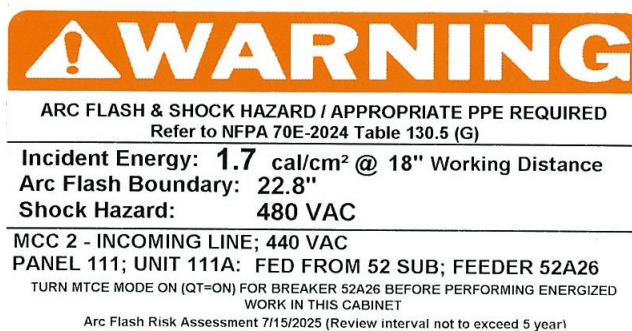


Our Services

NFPA 70E Arc Flash Assessments/Labeling

Be compliant with NFPA 70E Arc Flash Hazard Labeling:

- Gather your existing one-Line diagrams, or develop new ones if necessary
- Collect your existing electrical equipment data
- Perform an Arc Flash Hazard Analysis using EasyPower software and based upon NFPA 70E and IEEE 1584 standards
- Provide a report of the data collected and information to appear on label
- Recommend corrective actions if necessary.
- Print and affix labels on corresponding pieces of equipment
- Update one-line diagrams as required
- Provide appropriate training



Preventive/Predictive Maintenance Services

- Infrared Thermography
- Program Development and Management
- Reliability Centered Maintenance (RCM)
- Root Cause Analysis
- Ultrasound and Vibration Analysis



Bulwark and Red Kap Industrial Apparel

CT&D is an authorized Bulwark and Red Kap Apparel supplier. Please contact us for a catalog and our competitive pricing. Also, see our ad on the back cover.



Safety Program Assistance

- Audits
- ECPs
- General Industry Safety Training
- Inspection Preparation
- LOTOs
- PPE
- Program Development and Facilitation
- Safety Manuals/Logs
- SJPs





Our Services

Technical Staffing and Field Support

CT&D can provide you with a support professional in any of the following areas:

- CAD
- Consulting
- Electrical
- Maintenance
- Mechanical
- Operations
- Process Automation
- Project Management
- Quality
- Reliability
- Safety
- Supervision
- Training Coordinator/Program Management



Technical Training

CT&D can satisfy your training needs in any of the following areas:

- Catalog Courses
- Curriculum Development
- Customized Training
- Drives
- Electrical Maintenance Programs
- HMI
- Instrumentation
- Mechanical Maintenance Programs
- Needs Assessments
- NFPA 70E
- On-site Training
- PLCs
- Process Lines and Facilities
- Training Program Management
- Reliability
- Safety
- Systems
- Testing (Written and Practical)





Advantages

Customer Benefits

- Achieved Goals
- Better Productivity
- Greater Job Satisfaction
- Improved Maintenance and Troubleshooting Skills
- Increased Knowledge
- Reduced Costs

Experienced Staff

Our Instructors and Consultants each average over 30 years of experience in industry and training.

Facilities and Equipment

CT&D offers its' customers a state of the art Technical Training Center in Merrillville, Indiana and uses the latest equipment and software.

Flexibility

CT&D always works with its' customers to schedule training and services when it's convenient for them.

Hands-on and Practical

Our training is always hands-on and practical. Classes are very interactive. Our instructors don't just read out of a book. They provide useful information by passing on their years of experience and are known for making difficult subjects easy to understand.

Hardware and Software Expertise

CT&D personnel are familiar with a variety of manufacturer hardware and software such as:

- ABB
- Allen-Bradley
- Autodesk
- Avtron
- Control Techniques
- Cutler-Hammer
- EasyPower
- Eaton
- General Electric
- Intellution
- Magnetek
- Modicon
- OMNI Flow Computers
- Omron
- P&H
- Reliance
- Rexroth
- Robicon
- Rockwell Automation
- Rosemont
- SEL
- Siemens
- Square D
- Vickers
- Westinghouse
- Wonderware





Satisfied Customers

Abbott Labs	Cummins, Inc.	Kloeckner Metals	Praxair
AHF Products	Dome Pipeline	Knauf Fiber Glass	Precoat Metals
Air Products & Chemicals	Dominion Troy Energy	Leggett and Platt	Purdue University
Alumina Partners of Jamaica	Dow Chemical	Littelfuse	Regeneron Pharma
AM General	DTE Energy	Magnetek	Roche Vitamins, Inc.
Ameren Energy Generating	DuPont	Maple Leaf Farms	Sargent & Lundy
American Licorice	E Tech Group	Marathon Ashland Pipeline	Scheffer, Inc.
Amgen	East Bay Municipal Utility	Marathon Petroleum	Siegal Steel
Ann Arbor Machine	Eastman Chemical	McGill Machine Rebuild	Siemens
Apollo America Corporation	Ecolab	Meade Electric	Solo Cup
Applied Power & Controls	Exxon Mobil	Merit Steel	Sonoco Packaging
Arconic	Feralloy Processing Co.	Metallus	Steel Technologies
Atkore	Fermilab	Metro. Water Rec. District	Steel Warehouse
Bacardi & Co.	Finning Canada	Minnesota State University	Sterling Steel
Bayer Corporation	Flame Logic	M-TEC	Sullair
Boeing	Ford Motor Company	NASA Glenn Research	SunCoke Energy
BP US Pipelines & Logistics	General Electric	National Gypsum	Swagelok
Bull Moose Tube	General Mills	Natural Ovens	Tate & Lyle
Cargill, Inc.	Georgia Pacific	Navy Public Works	The Ohmart Corp.
Central Processing Eng.	Gerber Food Products	Nestle	Thermal Process
CFC International	Goodrich	Niagara LaSalle	U.S. Steel
Chemical Lime Company	Great Lake Dredge & Dock	Nicor Gas	Unilever
Chevron Phillips	Great Lakes Metals	NIPSCO/NISOURCE	United Parcel Systems
Citizens Gas & Coke Utility	Harley Davidson	NLMK Indiana	US Filter Control Systems
Cleveland Cliffs	Honeywell	Northern Electric	US Gypsum
Clyde's Donuts	Hydro Aluminum	Novelis	USS POSCO
Compania Electrica	IBEW/NCEA	NS Wheeling-Nisshin	Virgin Is. Water & Power
Consolidated Grain & Barge	Indiana Pickling Processing	Nucor Steel	Visteon
Conagra Foods	ISA	Ohio State University	Walker Die Casting
Control Techniques	Jupiter Aluminum	Pactiv	West Shore Pipeline
Corn Products	Kelloggs	Pall Medical Corp.	Weyerhaeuser Products
CSL Behring	Kinder Morgan	Pfizer	Whallon Machinery
		Prairie Packaging	Worthington Industries

Testimonials

"Well prepared and presented. Instructor relates well with students, and firmly grounds the training with practical applications."

"Of all the electrical classes I have been in, this was the most informative and helpful in my day to day job."

"The course was very well set up. The instructor was knowledgeable about the industry and the equipment"

"The course was fun, informative, and educational. The instructor was fantastic. He was very enthusiastic and knowledgeable about the drives, and how they work."

"Instructor put you at ease and made you feel comfortable."

"I learned a lot of useful information. The instructor was able to present the material at the level we needed, based on our knowledge coming into the course. He was very flexible in his plan, based on our needs."

"Crown trainers are always well prepared and keep topics interesting."

"Excellent presentation of drive information and basics! Instructor presents information in a way that all of the classroom attendees can understand. Very good labs."

"The content of this class was excellent! They incorporated our actual equipment into classroom setting very professionally. One of the better classes I've taken! Visuals of our actual equipment were clear and informative."

"Instructor explained any questions you have without making you feel bad. He did a great job. Great program!"

"The instructor always made sure we understood the material before going further. I'm glad I came, and will suggest it to others as well."

"Glad we had real problems to work on. Especially the communications problems rack to rack. The small class helped a lot to foster Q & A's."



Experience and Industries Served

CT&D instructors and consultants average over 30 years of experience and have provided a variety of services in the following industries.

Automotive



Consumer Products



Biotechnology



Food





Experience and Industries Served

Industrial Gases & Chemicals



Metals



Material Handling



Packaging





Experience and Industries Served

Petroleum & Pipeline



Transportation



Pharmaceutical



Utilities





Training Options

Catalog Courses

CT&D offers regularly scheduled courses throughout the year at its' Technical Training Center in Merrillville, Indiana in the following areas:

- Computer Aided Design (CAD)
- Drives
- Electrical
- Human Machine Interface (HMI)
- Instrumentation
- Maintenance
- Mechanical
- Process Lines and Facilities
- Programmable Logic Controllers (PLCs)
- Safety

Please see the Table of Contents for more specific topics.

Mentoring

CT&D can provide an onsite mentor that is familiar with your processes and will teach maintenance and troubleshooting techniques to your employees.

On-Site Training

On-site training is also available.



Customized Training

CT&D can customize training to fit your application and emphasize maintenance and troubleshooting techniques.





Catalog Courses

Computer Aided Design (CAD)

Basic AutoCAD:

8 am to 4 pm cst 4 days: Monday – Thursday \$1450

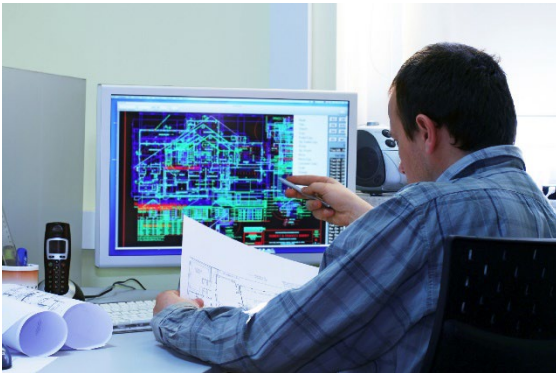
This course is an introduction to computer-aided drafting (CAD) using the AutoCAD LT software program.

Topics include: graphics and text windows, user interface, basic commands, creating drawings, editing drawings, organizing, printing, dimensioning, annotating, creating templates, and advanced layouts, and an introduction to 3-D.

Poly-lines and splines, hatching, printing, creating and setting up paper space layouts, blocks, attributes, and external references are also covered.

Prerequisites: Prior experience with Microsoft Windows

Jan. 5-8 Mar. 30-Apr. 2 Jul. 6-9
Oct. 5-8



Drives

Allen-Bradley PowerFlex AC Drive:

8 am to 4 pm cst 4 days: Monday – Thursday \$1850

This course is for engineering and maintenance personnel responsible for installing, maintaining, and troubleshooting drive systems that utilize the PowerFlex AC Drive.

Topics include: Configuration switches and jumpers within the drive, drive terminal points, critical drive parameters, using the keypad to view and change parameters, reading and interpreting control block diagrams, and using the display to aid in troubleshooting.

Labs include: Configuration and start-up the drive, interface the drive with a PLC, configuring digital I/O, speed references, skip frequencies, ramp rates, stop modes, using drive software, troubleshooting, and configuring communication modules for data transfer.

Prerequisites: None

Jan. 5-8 Mar. 30-Apr. 2 Jul. 6-9
Oct. 5-8

Allen-Bradley PowerFlex DC Drive:

8 am to 4 pm cst 4 days: Monday – Thursday \$1850

This course is for engineering and maintenance personnel responsible for installing, maintaining, and troubleshooting the PowerFlex DC Drive.

Topics include: Switches/jumpers, parameters, control block diagrams, and troubleshooting.

Labs include: Drive startup, configuring Digital I/O, Drive software, troubleshooting, and communications.

Prerequisites: None

Jan. 12-15 Apr. 6-9 Jul. 13-16
Oct. 12-15





Catalog Courses

Drives

Siemens 6RA70 Drive:

8 am to 4 pm cst 4 days: Monday – Thursday \$1850

This course is for engineering and maintenance personnel responsible for installing, maintaining, and troubleshooting the 6RA70 DC Drive.

Topics include: Hardware configurations, software configuration, analog & digital I/O, and troubleshooting.

Lab exercises include: Parameter settings, analog & binary I/O configuration, and troubleshooting.

Prerequisites: None

Jan. 5-8 Mar. 30-Apr. 2 Jul. 6-9
Oct. 5-8



Drives

Siemens 6RA80 Drive:

8 am to 4 pm cst 4 days: Monday – Thursday \$1850

This course is for engineering and maintenance personnel responsible for installing, maintaining, and troubleshooting drive systems that utilize the 6RA80 DC Drive.

Topics include: Drive and electrical safety, DC drive basics, drive hardware, drive diagrams, setting-up and commissioning the drive, optimizing and tuning the drive, operating the drive (via CUD, BOP20, AOP30), configuring the drives' analog and digital I/O and feedback options, troubleshooting the drive, using Starter PC software, and PROFIBUS Communications.

Lab exercises include: Power section connections, parameter settings, drive initial setup requirements, self-tuning, analog & binary I/O configuration, troubleshooting, and diagnostic features of the hardware and software.

Prerequisites: None

Jan. 12-15 Apr. 6-9 Jul. 13-16
Oct. 12-15





Catalog Courses

Electrical

AC Crane Control:

8 am to 4 pm cst 4 days: Monday – Thursday \$1750

This course is for engineering and electrical maintenance personnel responsible for installing, maintaining, and troubleshooting AC Crane Controls that utilize the IMPULSE AC Drives.

Topics include: Crane safety-lockout, variable frequency drives, flux vector drives, bridge drive and motor, trolley drive and motor, main hoist drive and motor, eddy current brakes, setup and tuning the IMPULSE AC Drive, parameterization of the IMPULSE AC Drive, and troubleshooting drive and motor problems.

Lab exercises include: Familiarization of the IMPULSE AC Drive hardware including the diode front end, the DC Buss, and the output power section, wiring up the power sections, wiring up the I/O, setting up the initial parameters, tuning the drive, programming the drive, and troubleshooting drive issues.

Prerequisites: None

Jan. 26-29 May 4-7 Aug. 10-13
Nov. 2-5

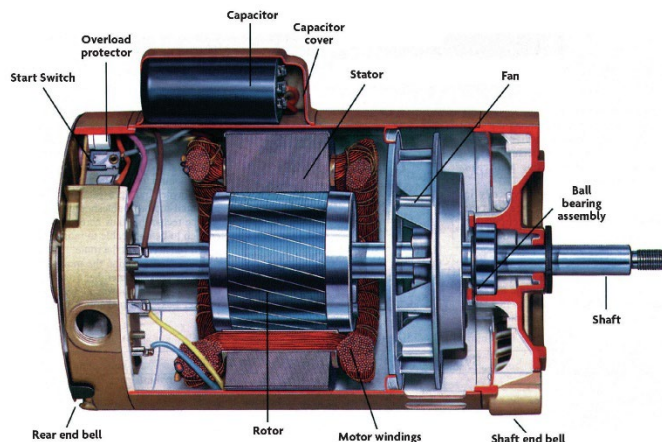
Basic Industrial Electricity:

8 am to 4 pm cst 4 days: Monday – Thursday \$1750

Course topics include: Basic electrical wiring, electrical safety and theory, Digital multi-meters, lighting circuits, electro-mechanical relays, motor operation, and basic motor control.

Prerequisites: None

Jan. 19-22 Apr. 20-23 Jul. 27-30
Oct. 19-22



Electrical

Electrical Control Circuits and Troubleshooting:

8 am to 4 pm cst 4 days: Monday – Thursday \$1750

Course topics include: Control circuits, troubleshooting, two-wire control with manual selection, overload protection, three-wire control-start/stop/jog/inch circuits, sequence start and stop, automatic sequence starting, reversing circuits, plug and anti-plug circuits, two speed motor control, and reduced voltage starting circuits.

Prerequisites: None

Jan. 26-29 Apr. 27-30 Aug. 3-6
Oct. 26-29



Motor Maintenance and Troubleshooting:

8 am to 4 pm cst 4 days: Monday – Thursday \$1750

This course is designed for motor maintenance personnel. It presents the procedures needed to locate and correct a malfunction in an electric motor quickly and efficiently.

Topics include: Electrical safety, magnetism, transformers, motors, DC motor control, motor maintenance, brakes, AC motor control, and AC motors.

Prerequisites: None

Feb. 9-12 May 11-14 Aug. 3-6
Nov. 9-12



Catalog Courses

Electrical

Reading Electrical Drawings:

8 am to 4 pm cst 4 days: Monday – Thursday \$1450

This class is designed to improve your ability to read, interpret and analyze electrical ladder diagrams.

Topics include: Electrical symbols, ladder diagram layout, basic rules of ladder drawings, and types of control devices, differences between electromechanical and solid-state relays, and the role of the programmable controllers and drives in electrical control.

Prerequisites: None

Feb. 16-19 May 11-14 Aug. 17-20
Nov. 16-19



Electrical

Switchgear Breaker Safety and Maintenance:

8 am to 4 pm cst 3 days: Monday – Wednesday \$1350

This course is a comprehensive overview of medium voltage circuit breakers used in industrial applications and covers main components, operation (single-line, 3-line, connection and interconnection diagrams) and minor maintenance. It also covers the insertion/removal (Racking) of circuit breakers, arc-flash protection, safety, and PPE requirements.

Topics include: Status indicators, protective relaying (ANSI/IEEE device numbering), and substation components, Control schemes: stored energy and magnetic, X-Y anti-pump control circuit, and breaker trip circuits.

Prerequisites: None

Mar. 30-Apr. 1 Jun. 8-10 Sep. 14-16
Nov. 30-Dec. 2





Catalog Courses

Human Machine Interface (HMI)

Allen-Bradley Basic FactoryTalk View ME

8 am to 4 pm cst 4 days: Monday – Thursday \$1850

This course provides you with the skills necessary to develop FactoryTalk View Machine Edition (ME) applications that run on a PC or PanelView Plus terminals.

You will create new applications; with FactoryTalk View ME software and RSLinx Enterprise software, and practice creating, configuring, and animating graphic objects on graphic displays.

Also covered are creating and configuring messages and alarms to alert operators, trending and how to set up security for graphic displays or rights to perform certain actions. You will then prepare a PanelView Plus terminal for operation and download FactoryTalk View ME applications to a PanelView Plus terminal.

Prerequisites: Working knowledge of Windows environment

Feb. 23-26 May 11-14 Aug. 3-6
Nov. 2-5



Human Machine Interface (HMI)

GE Fanuc Basic Proficy HMI/SCADA Cimplicity:

8 am to 4 pm cst 4 days: Monday – Thursday \$1850

Participants will configure a project and I/O drivers to communicate with Cimplicity. create and edit point database tags and graphic screens. Configure a system for operator controls, alarming, logging, and security. Develop and modify operator screens, alarm viewers, and trend charts.

Prerequisites: Working knowledge of Windows environment

Mar. 23-26 Jun. 22-25 Sep. 28-Oct. 1
Dec. 14-17



GE Fanuc Basic Proficy HMI/SCADA iFix:

8 am to 4 pm cst 4 days: Monday – Thursday \$1850

This course is designed for those who develop, configure, and use applications with an iFIX system. Participants will configure iFIX nodes and I/O drivers to communicate with iFIX. Create and edit process database tags and graphic screens. Configure a system for operator controls, alarming, logging, and security. Develop operator screens, alarm screens, and trend screens.

Prerequisites: Working knowledge of Windows environment

Feb. 2-5 May 18-21 Aug. 24-27
Nov. 16-19



Catalog Courses

Instrumentation

Basic Instrumentation:

8 am to 4 pm cst 5 days: Monday – Friday \$1950

This course uses classroom and laboratory exercises to build a foundation in industrial measurement and control.

The basic concepts of pressure, level, flow, temperature, reading and interpreting basic piping and instrument drawings (P&ID) are included.

Students will calibrate transmitters and test measurement loops.

Prerequisites: None

Mar. 9-13 Jun. 8-12 Aug. 31-Sep. 4
Nov. 30-Dec. 4

Troubleshooting and Applied Instrumentation:

8 am to 4 pm cst 5 days: Monday – Friday \$1950

This course covers installation, calibration, and maintenance of measurement devices.

An examination of the devices used in measurement and control systems, such as PID (Proportional, Integral, and Derivative) controllers, transmitters, transducers, and recorders are covered.

Topics include: loop characteristics, test equipment, calibration, and configuration, maintenance and installation, working in hazardous locations, and trends. Reading and interpreting advanced Piping and Instrument Drawings (P&ID) will also be included.

Prerequisites: Basic Instrumentation

Mar. 16-20 Jun. 15-19 Sep. 14-18
Dec. 14-18



Instrumentation

Piping and Instrument Diagram (P&ID) Print Reading and Red-Lining:

8 am to 4 pm cst 2 days: Thursday-Friday \$950

This class is designed to improve your ability to read and interpret piping and instrument diagrams.

Topics include: the importance of P&IDs, identifying and describing the parts of a typical P&ID, using legend sheets to identify symbols and labels used in a P&ID, explanation of instrument and control loops, redlining and marking-up a P&ID, submitting redlines and verification of corrected P&IDs.

Prerequisites: None

Mar. 26-27 Jun. 25-26 Oct. 1-2
Dec. 10-11

Scales:

8 am to 4 pm cst 3 days: Monday – Wednesday \$1350

This course presents an introduction to weighing systems.

The following topics are covered: Tension strain gage load cells, motion weighing, how a load cell works, how to troubleshoot load cell and weighing systems, calibration methods, and how Handbook 44 applies to weighing systems.

Prerequisites: None

Mar. 23-25 Jun. 22-24 Sep. 28-30
Dec. 7-9

Tuning PID Loops:

8 am to 4 pm cst 5 days: Monday – Friday \$1950

This course reviews and then builds upon the concepts of proportional, integral and derivative control with advanced topics such as cascade, ratio and feed-forward control being covered.

Various methods of controller tuning are reviewed and practiced. Control loop troubleshooting techniques for single-loop and multi-loop systems are included. A review of reading and interpreting advanced Piping and Instrument Drawings (P&ID) is also covered.

Prerequisites: Basic Instrumentation and Troubleshooting & Applied Instrumentation

Mar. 2-6 Jun. 1-5 Sep. 21-25
Nov. 30-Dec. 4



Catalog Courses

Maintenance

Basic Preventive and Predictive Maintenance:

8 am to 4 pm cst 2 days: Thursday - Friday \$950

This course provides the necessary fundamentals and best practices required to prevent and predict failures at the equipment or process level. Understanding process and equipment specifications, failure tracking statistics, and scheduled maintenance tasks required to extend the life of an asset.

Topics include: Predictive Maintenance Tools that can be used to detect problems in an asset before it has reached a critical point of failure. Maintenance tracking, measurements and statistics, continuous improvement activities, root cause failure analysis, risk assessment and prioritization, inspections, scheduling and integration of best practices.

Prerequisites: None

Feb. 12-13 Jun. 11-12 Aug. 27-28
Oct. 29-30

Basic Troubleshooting Skills:

8 am to 4 pm cst 4 days: Monday – Thursday \$1850

This course is designed to improve your ability to logically troubleshoot electrical issues, distinguish between electrical/mechanical problems, “divide and conquer” problems, and increase your troubleshooting efficiency.

Topics include: Basics of troubleshooting, basics of electrical troubleshooting, basics of “controls” troubleshooting, troubleshooting DC drive issues, troubleshooting DC motor issues, troubleshooting AC motor issues, troubleshooting AC drive issues, the basics of a process/process line, troubleshooting process/process line issues. These topics are all presented in a practical manner that is very beneficial for electrical maintenance personnel.

Prerequisites: None

Feb. 23-26 Apr. 13-16 Aug. 10-13
Oct. 12-15

Maintenance

Industrial Maintenance Planning and Scheduling:

8 am to 4 pm cst 2 days: Monday – Tuesday \$950

This course provides the various types of maintenance principles and best practices utilized to strive towards world class maintenance planning, scheduling and implementation. Emphasis will be on short term maintenance planning, focusing on daily, weekly, and monthly maintenance activities to improve plant reliability.

Topics include: Emergency breakdowns, job scoping, CMMS philosophy, Risk Prioritization, planning Safety, PM, Continuous improvement - PDCA, required resources/tools/materials-standards, procedures and effective scheduling.

Prerequisites: None

Jan. 12-13 Apr. 13-14 Jul. 27-28
Nov. 23-24

Introduction to Reliability Centered Maintenance (RCM):

8 am to 4 pm cst 3 days: Monday – Wednesday \$1350

This introductory course provides the necessary fundamentals and knowledge to implement a RCM process to ensure that the correct maintenance activities are developed and performed, based on equipment criticality and the potential consequences of failure, when necessary, at the optimal time to improve plant safety, equipment reliability, uptime, reducing maintenance cost.

Topics include: prioritizing equipment based on criticality, analyzing the functions of the equipment, how it can fail, failure modes, risk assessment, the effect of equipment failure, tasks to be done to prevent failure, maintenance scheduling, maintenance tracking, root cause analysis, targeting maintenance activities where they will have the greatest impact to improve reliability.

Prerequisites: None

Feb. 9-11 Jun. 8-10 Aug. 24-26
Nov. 9-11



Catalog Courses

Maintenance

Introduction to Vibration Measurement and Analysis:

8 am to 4 pm cst 2 days: Monday - Tuesday \$950

This course provides a basic understanding of vibration theory, measurement fundamentals and monitoring tools, required for vibration measurement, monitoring and analysis of vibration-related industrial system applications.

Topics include: displacement, velocity, acceleration measurements in terms of mass and speed. Also, monitoring methods, vibration as a PM tool and equipment maintenance practices.

Prerequisites: None

Mar. 2-3 May 18-19 Aug. 10-11
Oct. 12-13

NFPA 70B Standard for Electrical Equipment Maintenance:

8 am to 4 pm cst 1 days: Friday \$550

This course is based upon the NFPA 70B Standard for Electrical Equipment Maintenance.

Topics include: requirements for safeguarding persons, property and processes from failure and breakdown, standards to establish a condition of maintenance of electrical equipment for safety and reliability, the relationship between NFPA 70E and NFPA 70B, electrical maintenance programs, single-line diagram requirements, incident energy analysis, testing specifications, maintenance intervals, equipment condition assessment, protection devices, power distribution transformers, rotating equipment, motor controls, specific equipment maintenance requirements, types of maintenance, NFPA 70B maintenance best practices. OSHA may use these standards as the basis for issuing citations.

Prerequisites: None

Jan. 9 Feb. 6 Mar. 6
Apr. 3 May 8 Jun. 5
Jul. 3 Aug. 7 Sep. 11
Oct. 9 Nov. 6 Dec. 4

Maintenance

Outage Planning, Plant Shutdowns, and Turnarounds:

8 am to 4 pm cst 2 days: Thursday-Friday \$950

This course provides project leaders and maintenance managers with an overview of the different types of process plant shutdowns (planned, unplanned, emergency), managing events, efficient plant turnarounds and start-up philosophies. Emphasis will be on planning long-term maintenance activities and project management.

Topics include: 5 phases - initiating, planning, executing, controlling, and closing. Disaster recovery, scheduling, estimation, contractor and safety management, tracking critical milestones and post shut down review.

Prerequisites: None

Mar. 12-13 Jun. 18-19 Sep. 17-18
Dec. 17-18

Root Cause Failure Analysis and Problem Solving Tools:

8 am to 4 pm cst 2 days: Thursday-Friday \$950

This course provides the necessary philosophy, fundamentals and problem-solving methodology to reduce future (equipment, system or process) failures, resultant from the development of a root cause failure analysis. The analysis process utilizes problem-solving tools that identifies corrective actions which includes risk assessment and prioritization.

Topics include: measurements and statistics, root cause failure analysis, risk assessment and prioritization, analytical analysis and corrective actions that can be applied across safety, environmental, quality, production and maintenance.

Prerequisites: None

Feb. 19-20 May 21-22 Aug. 20-21
Nov. 19-20



Catalog Courses

Mechanical

Basic Hydraulics and Pneumatics:

8 am to 4 pm cst 4 days: Monday – Thursday \$1750

This course is designed for those who are responsible for the operation and maintenance of industrial hydraulic systems. Also, those who simply wish to acquire a basic knowledge of hydraulic systems will benefit from this course.

Basic hydraulic principles and laws will be covered, along with detailed descriptions of the theory and operation of all essential components.

Hands on exercises will be conducted using industrial grade equipment. Various pumps will be discussed including power requirements to drive these pumps.

Detailed maintenance practices directed to promote reliable equipment service is part of the presentation. Troubleshooting and construction of basic systems are incorporated in the lab exercises.

Prerequisites: None

Mar. 2-5 Jun. 15-18 Aug. 24-27
Oct. 26-29

Basic Machine Alignment:

8 am to 4 pm cst 2 days: Monday – Tuesday \$1150

This course presents the basics of Machine Alignment. Assessments, Tools, and Field Exercises are covered.

Upon completion, the student should be able to: discuss why alignment is beneficial, read and interpret measuring instruments, describe a soft foot, make shim size calculations, demonstrate straight edge alignment techniques, demonstrate the use of a dial indicator in an alignment application. Laser alignment is also covered.

Prerequisites: None

Mar. 16-17 Jun. 29-30 Aug. 31-Sep. 1
Dec. 14-15

Mechanical

Fans, Blowers, and Compressors:

8 am to 4 pm cst 2 days: Monday – Tuesday \$1150

This course provides a basic understanding of compressors, the types, and the functions of different compressors, choosing a correct compressor for the application, the importance of application, the importance of maintenance practices and common problems associated with compressors. This course provides the basic operating methodology of fans, blowers. The formulas for calculating size and type of fans and blowers. The operation of the different styles of fans and blowers. The selection process for picking the correct style for your operation. The proper maintenance practices for fans and blowers.

Upon completion, the student will be able to identify types of compressors. Pros and con of selection for specific use. The maintenance practice for specific types. The energy efficiency of specific types of compressors. Upon completion, the student should be able to differentiate between fan and blower types, understand fan classification, affinity laws and fan selection. Also understand the maintenance required for different styles of fans

Prerequisites: None

Feb. 16-17 May 11-12 Aug. 17-18
Dec. 14-15

Mechanical Fasteners:

8 am to 4 pm cst 3 days: Monday – Wednesday \$1350

This course provides the necessary fundamentals and the best practices required to select and apply proper torquing methods for all grades of fasteners and their components such as locking washers and nuts.

Topics include: codes and standards, the purpose of select fasteners, torquing methods and signs of bolt failure.

Prerequisites: None

Jan. 19-21 Apr. 13-15 Jun. 29-Jul. 1
Oct. 19-21



Catalog Courses

Mechanical

Power Transmission:

8 am to 4 pm cst 5 days: Monday – Friday \$1850

This course provides the necessary fundamentals and knowledge essential for understanding a Power Transmission.

Topics include: units of measurement, Newton's Three laws, impulse and momentum, simple machines, statics, work, energy and power, dynamics, conservation of momentum, friction, mechanics of solids, conservations of energy, the laws of thermodynamics, gears, lubrication, bearings, shaft couplings, belt drives, chain drives, spindles, clutches, and brakes.

Prerequisites: None

Mar. 16-20 Jun. 1-5 Aug. 31-Sep. 4
Nov. 9-13

Pumps, Packing, and Seals:

8 am to 4 pm cst 3 days: Monday – Wednesday \$1350

This course will give you the introduction of various types of pumps, packing and seals. It will provide the fundamentals and problem-solving skills needed to tear down and rebuild pumps. It will cover centrifugal, hydraulic and pneumatic pumps. It will also cover mechanical seals.

This course dedicates time to disassemble and reassemble different types of pumps. How to diagnose problems with the pump and causes of failure. How to properly install different types of packing. It will show proper installation of mechanical seals.

Prerequisites: None

Feb. 16-18 May 18-20 Aug. 17-19
Nov. 16-18

Mechanical

Reading Mechanical Drawings:

8 am to 4 pm cst 4 days: Monday – Thursday \$1450

This course provides the student with the fundamentals essential to read and interpret Basic Mechanical Prints.

Topics include: Drawing symbols, drawing types including sections and views. Dimensioning and tolerances will be covered in detail. Students will be provided with classroom labs including reading prints and sketching exercises.

Prerequisites: None

Feb. 23-26 May 4-7 Aug. 10-13
Dec. 7-10

Valves and Valve Actuators:

8 am to 4 pm cst 3 days: Monday – Wednesday \$1350

This course provides a basic understanding of different types of valves, their characteristics, advantages, and disadvantages as well as distinct functions and proper applications. Different types of actuators used to drive these valves (electrical, mechanical, and pneumatic) as well as their advantages and disadvantages will be covered. Finally, the course will cover troubleshooting the hardware and common problems associated with these valves and actuators.

This course dedicates time in the disassembling and reassembling all the valves which includes butterfly, gate, globe, needle, metering, diaphragm, relief (blow-off), regulating, solenoid (electric control) and maxon valves. Additional time will be spent on operating and dismantling of actuators in the lab. Participants will learn how to use a 4-20 ma signal to drive some of the pneumatic valves.

Prerequisites: None

Feb. 16-18 May 18-20 Aug. 17-19
Nov. 16-18



Catalog Courses

Process Lines and Facilities

Process Line Fundamentals and Tension Analysis:

8 am to 4 pm cst 5 days: Monday – Friday \$1850

This course consists of subjects designed to provide an understanding of the various drives, which make up a process line and the application of electric motors, controls, and power supplies needed to satisfy their requirements. Practical application problems will be solved as part of the course.

Included in the course are discussions on DC motors, AC motors, multiple motor drives, bridles, helper drives, generators, thyristor power supplies, variable frequency power supplies, reels, storage devices, levelers, and side trimmers.

A practical discussion of the principles of bridle operation and the engineering required to obtain successful operation will be reviewed. An in depth discussion of reels, their components, and their operation on various types of process lines will be presented.

Tension Analysis calculations of a typical line will be discussed including how to calculate and handle bending and friction losses. During this course, students are encouraged to bring up particular problems for analysis.

Prerequisites: None

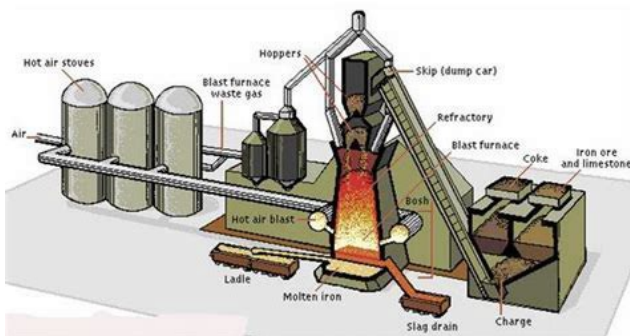
Jan. 12-16

Mar. 9-13

Jul. 20-24

Sep. 21-25

Process Lines and Facilities





Catalog Courses

Programmable Logic Controllers

Basic ControlLogix Maintenance and Troubleshooting:

8 am to 4 pm cst 4 days: Monday – Thursday \$1850

This course is for those who have little or no working experience with ControlLogix systems and who need to interpret, make changes to, and/or Draft Ladder Logic. Participants will identify the hardware associated with a Basic ControlLogix system, create and modify a Studio 5000 project, establish communications with a Controller, create and monitor Data Tags, document and search Ladder Logic.

Topics include: Communications, software menus, digital and analog I/O modules, basic instructions, troubleshooting features.

Labs include: Configuring communications drivers and setting IP addresses, configuring digital and analog I/O modules, modifying and programming instructions, relays (Bit), timers and counters, program control, compare compute, and math and analog scaling.

Prerequisites: None

Jan. 19-22 Apr. 6-9 Jul. 20-23
Oct. 19-22

Advanced ControlLogix Maintenance and Troubleshooting:

8 am to 4 pm cst 4 days: Monday – Thursday \$1850

This course is for those who develop, debug, program or maintain ControlLogix controllers using ladder logic, function block, and structured text programming. Students will be able to establish communications to a ControlLogix controller, explain the organization of a ControlLogix application, Perform routine maintenance, create a new project, configure I/O, download/upload projects, go online, change processor modes, create and monitor tags, and edit the program.

Topics include: Major, minor and I/O faults, GSV and SSV instructions, Ethernet communications, ControlNet communications, ADD-ON instructions, and an introduction to ladder diagram programming, function block programming, and structured test programming.

Labs include: creating and programming fault routines, configuring and scheduling an Ethernet and ControlNet LAN, and programing an ADD-ON instruction.

Prerequisites: None

Jan. 26-29 Apr. 13-16 Jul. 27-30
Oct. 26-29

Programmable Logic Controllers

GE Fanuc Basic PACSystems RX3i:

8 am to 4 pm cst 4 days: Monday – Thursday \$1650

This course examines the Series RX3i basic hardware and Proficy Machine Edition software. The power supply, CPU, discrete analog I/O modules are covered as well as project creation, hardware configuration, addressing, program organization and basic programming.

This course includes: Routine maintenance such as: going online, uploading/downloading, project backup, changing modes of operation, battery replacement, setting of the PLC time/date, changing addresses and editing variable descriptions.

Exercises include: Hardware configuration, programming basic instructions (relays, timers, counters, math, and compare), examples of control circuits, alarm circuits and analog scaling, and troubleshooting features of the software and I/O card maintenance.

Prerequisites: None

Feb. 2-5 Apr. 20-23 Jul. 13-16
Nov. 2-5

GE Fanuc Advanced PACSystems RX3i:

8 am to 4 pm cst 4 days: Monday – Thursday \$1650

This course covers advanced instructions (data transfer, bit manipulation, user defined function blocks, and PID loops), Genius I/O installation and configuration, Genius Hand-Held Monitor, and troubleshooting.

Topics include: Ethernet Global Data, Genius communications, and Genius I/O hardware.

Hands-on exercise include: Programming user defined function blocks, Genius LAN setup and configuration, transferring data on an Ethernet LAN and a Genius LAN, and PID loops.

Prerequisites: None

Feb. 9-12 Apr. 27-30 Jul. 20-23
Nov. 9-12





Catalog Courses

SAFETY

First Aid, CPR, and AED:

8 am to 12 pm cst 1 days: Friday \$275

The First Aid/CPR/AED program teach participants the knowledge and skills needed to give immediate care to an injured or ill person and to decide whether advanced medical care is needed. This program offers a choice of first aid, cardiopulmonary resuscitation (CPR) and automated external defibrillator (AED) courses to meet the various training needs of a diverse audience. Certification by the American Red Cross is valid for two years.

Course topics include: Your Role in an Emergency, Adult Cardiac Emergencies, CPR/AED, Choking, Sudden Illness, Life-Threatening Bleeding, Injuries and Environmental Emergencies.

Prerequisites: None

Apr. 3	May 8	Jun. 5
Oct. 9	Nov. 6	Dec. 4

General Industrial Safety:

8 am to 4 pm cst 2 days: Wednesday - Thursday \$950

This program is intended to provide instruction on a variety of general industry safety and health standards.

Course topics include: Introduction to OSHA, Inspections, Citations and penalties, walking and working surfaces, means of Egress and fire protection, hazardous materials, personal protective equipment, machine guarding, hazard communication, blood borne pathogens, and safety and health programs.

Prerequisites: None

Feb. 4-5	Apr. 22-23	Jul. 8-9
Nov. 11-12		

SAFETY

NFPA 70E Standard for Electrical Safety in the Workplace:

8 am to 4 pm cst 1 day: Friday \$550

This course is based upon the NFPA 70E Standard for Electrical Safety in the Workplace.

Topics include: OSHA and NFPA 70E. Mitigating shock hazards, Arc Flash hazards and Arc Blast hazards by selecting the appropriate protective strategies, safe electrical work practices, determining shock boundaries and arc flash boundaries, selecting and using personal protective equipment (apparel, tools, and test equipment), reading and interpreting arc flash labels, and inspecting and maintaining PPE.

Prerequisites: None

Jan. 9	Feb. 6	Mar. 6
Apr. 3	May 8	Jun. 5
Jul. 3	Aug. 7	Sep. 11
Oct. 9	Nov. 6	Dec. 4





Electrical Maintenance Program

Course Description	Contact Hours
DC Electricity I	40
This course is an introduction to DC electricity and covers how to solve trade-related problems using basic mathematical skills. Topics include: how changes in the value of voltage, current or resistance affect the circuit, the methods of producing electromotive force (EMF), resistor types and ratings. Participants will connect and analyze a series resistive circuit, parallel resistive circuit, and series-parallel resistive circuits.	Week 1
DC Electricity II	40
This course is a continuation of DC Electricity I. Topics include: the requirements for installation and maintenance of batteries, the characteristics of magnetic and electromagnetic materials, the generation of electricity in dc generators, the properties of conductors, semiconductors, insulators and fiber optic cables. Participants will splice, tap and terminate conductors, connect switching circuits using schematic and wiring diagrams, and determine the conductors required for installations.	Week 2
Applications of DC Electricity	40
This course is a continuation to DC Electricity II. Topics include: relays and controls, inductance, capacitance, time constants, wave shaping, and an introduction to DC motors. Participants will connect and use electrical meters to measure circuit properties of a full voltage starter.	Week 3
AC Electricity I	40
This course is an introduction to alternating current and covers how to solve trade-related problems using basic mathematical skills. Topics include: the fundamentals of alternating current (AC) and the characteristics of AC circuits. Components covered are resistors, inductors in circuits, capacitors in circuits, calculating power, reactive power and apparent power in AC circuits. Participants will also connect and analyze AC series circuits containing resistors, inductors and/or capacitors.	Week 4



Electrical Maintenance Program	
Course Description	Contact Hours
AC Electricity II	40
This course is a continuation of AC Electricity I. Topics include: AC series circuits that contain resistors and inductors, resistors and capacitors, and resistors, inductors, and capacitors (RLC), and parallel AC circuits containing resistors, inductors or capacitors. Additionally, power factor correction and transformers are covered.	Week 5
Applications of AC Electricity	40
This course is a continuation of AC Electricity II. Topics include: three-phase induction motors, relays and contactors, timers and smart relays, control and protective devices for a motor branch circuit. Participants will connect and analyze full voltage non-reversing (FVNR) motor control circuits and full voltage reversing (FVR) motor control circuits.	Week 6
Reading Electrical Drawings	40
This course presents the basic electrical device symbols and drawing practices used in the various drawing types. Topics include: layout and equipment drawings, conduit and cable schedules, single line diagrams, connection diagrams, schematics (prints), and elementary drawings. Programmable Logic Controller (PLC) I/O prints, crane control prints, and motor control prints are also included.	Week 7
Basic AutoCAD	40
This course is an introduction to computer-aided drafting (CAD) using the AutoCAD LT software program. Topics include: graphics and text windows, user interface, basic commands, creating drawings, editing drawings, organizing, printing, dimensioning, annotating, creating templates, and advanced layouts, and an introduction to 3-D. Poly-lines and splines, hatching, printing, creating and setting up paper space layouts, blocks, attributes, and external references are also covered.	Week 8



Electrical Maintenance Program

Course Description	Contact Hours
Advanced AutoCAD	40
This course is a continuation of the Basic AutoCAD class, using the AutoCAD LT software program. This course comprises topics including: advanced text, tables, advanced annotation, dynamic block, attributes, sheet sets, managing layers, CAD standards, system setup, and customization. The course applies the AutoCAD LT program to electrical and mechanical drawings. Additional topics include: editing electrical drawings, mechanical drawings, piping and instrument drawings, rendering, and PLC drawings.	Week 9
Electrical Safety and Codes	40
This course covers NFPA 70E Electrical Safety in the Workplace and NFPA 70 National Electrical Code for general industry. This course comprises topics including: electrical hazards, arc flash hazards, interpreting arc flash labels, describing the requirements for qualified personnel, identifying the types of and required personal protective equipment. Additional topics include: branch-circuits, feeders, switchboards, panelboards, disconnects, over-current protection, grounding, wiring, switches, lighting, and emergency systems codes.	Week 10
Analog Electronics	40
This course is an introduction to analog electronic components and basic circuits. Topics include: the operation and symbols for diodes, zener diodes, light emitting diodes, transistors, junction field effect transistors, metal oxide semiconductor field effect transistors, silicon controlled rectifiers, TRIACs, unijunction transistors, DIACs, and IGBTs. Circuit applications such as clippers, clampers, regulators, optical isolators, DC power supplies and filters, and SCR/IGBT packages are also covered.	Week 11
Digital Electronics	40
This course is an introduction to Digital Electronic components and their basic circuits. Topics include: number systems and conversion, the basic logic gates, advanced logic gates, Boolean expressions, truth tables, encoding and decoding, and types of flip-flops. Applications such as counters, registers, math, analog to digital conversion, and digital to analog conversion in PLCs and other electronic equipment are also covered.	Week 12



Electrical Maintenance Program	
Course Description	Contact Hours
Applied Electronics	40
This course covers basic electronic circuits typically used in an industrial environment. Topics include: bipolar transistor amplifiers, typical amplifiers and switches, amplifier classes, signal coupling, field effect transistor amplifiers, operational amplifiers, and oscillators. Applications such as function block programming, analog input and output cards, motor drive controls, summing junctions, speed reference generation and selection, and motor drive diagrams are also covered.	Week 13
Electrical Power Systems	40
This course covers industrial power distribution. Topics include: an overview of the NFPA 70E PPE requirements, working on or racking a switchgear breaker in/out, power system distribution using single line diagrams, types of breaker X/Y closing schemes, motor starting application and control, 3 phase AC transformer connections, instrument transformers, circuit protection and relay coordination.	Week 14
Motor Maintenance and Troubleshooting	40
This course covers the construction, operation, maintenance and troubleshooting of AC and DC Motors. This course comprises topics including: electricity and motors, magnets and magnetic fields, DC motor parts, DC generators, DC motor types and operation, AC motor theory and operation, motor lead identification and connections. Additional topics include: troubleshooting, testing and maintenance of DC motors and AC motors, and motor test equipment.	Week 15
Electrical Control Circuits and Troubleshooting	40
This is a continuation of Motor Maintenance and Troubleshooting, which encompasses motor control circuits. This course comprises topics including: two-wire control with manual selection, overload protection, three-wire control, start/stop/jog/inch circuits, sequence start and stop, automatic sequence starting, reversing circuits, plug and anti-plug circuits, two speed motor control, and reduced voltage starting circuits. Additional topics include: wiring, testing and troubleshooting of control circuits.	Week 16



Electrical Maintenance Program	
Course Description	Contact Hours
ControlLogix Maintenance and Troubleshooting	40
This course is an introduction for those who need to interpret and edit ladder logic, and also maintain or troubleshoot an AB ControlLogix PLC. This course comprises topics including: configuring the CPU, communications modules, digital I/O modules, analog I/O modules, troubleshooting, and reading I/O diagrams. Additional topics include: modifying and programming relays (Bit) instructions, timer instructions, counter instructions, program control instructions, compare instructions, compute instructions, math instructions, and also analog input and output scaling are also covered.	Week 17
AC/DC Drives	40
This course comprises DC Drive topics including: the DC motor armature, counter-emf, regenerative and dynamic braking, shunt, series, and compound motors, base speed, constant torque, constant horsepower, feedback, and DC motor quadrant operation. This course also comprises AC Drive topics including: AC motor stator, rotor, concepts of locked rotor, torque, synchronous speed and motor slip, AC motor code letters, AC motor torque, and identifying motor leads. Configuring a DC drive and an AC drive and troubleshooting techniques are also covered.	Week 18
Basic Instrumentation	40
This course introduces the concepts of temperature, level, flow and pressure. This course comprises topics including: types of control, piping and instrument drawings (P&ID), hand switches, limit switches, proximity switches, pressure switches, level switches, flow switches, temperature switches, and current loops. Additional topics include: operation and calibration of pressure transmitters, level transmitters, flow transmitters, current to pneumatic converters (I/P), pneumatic to current converters (P/I), pressure to level conversion, level to pressure conversion, differential pressure, and square root extractors are also covered.	Week 19
Applied Instrumentation	40
This course is a continuation of Basic Instrumentation and covers the concepts of closed loop control and tuning. This course comprises topics involving: feedback, on/off control, proportional control, integral control, derivative control, pneumatic controllers, analog electronic controllers, digital electronic controllers, PID tuning, and process safety. Additional topics include: loop tuning of various control schemes using GE Fanuc PLC PID's, AB ControlLogix PLC PID's, Rosemont electronic PID controller, and Moore controller.	Week 20



Electrical Maintenance Program	
Course Description	Contact Hours
Human Machine Interface (HMI)	40
This course provides the tools to develop FactoryTalk View Machine Edition (ME) applications that run on a PC or Panel View Plus terminals. This course comprises topics including: creating new applications, FactoryTalk View ME software and RSLinx Enterprise software, creating, configuring, and animating graphic objects in graphic displays. Additional topics include: creating, configuring messages and alarms, trending, security for graphic displays or for rights to perform certain actions, and downloading FactoryTalk View ME applications to a Panel View Plus terminal.	Week 21
System Troubleshooting I	40
This course is for those who are responsible for maintaining a PLC control system and who are familiar with basic ladder logic, controller concepts, safety devices and safety schemes, and electrical test equipment. Topics include: system overview, troubleshooting procedures, test measurements, PLC safety devices, discrete inputs, discrete outputs, analog inputs, and analog outputs. Participants will troubleshoot controller problems, digital I/O problems, analog I/O problems, and power supply problems.	Week 22
System Troubleshooting II	40
This course is a continuation of System Troubleshooting I. Topics include: the troubleshooting of valve starters, pump starters, motor drives, PID controllers and communications. Participants will also troubleshoot motor starter circuits, motor drives controlled manually and by a PLC, PID controllers, and communications.	Week 23
Curriculum Total	Hours
Total curriculum hours over a 23-month period:	920

Customized programs to meet your needs as well as flexible and “fast-track” scheduling are available.

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Mechanical Maintenance Program

Course Description	Contact Hours
Introduction to Basic Machines	40
This course provides an overview of mechanical systems. Simple machines, such as the lever, inclined plane, and wheel are the building blocks of most complex mechanical systems. Topics include: how machines manipulate mechanical forces, distance and friction, mechanical advantage. With the foundational information presented in this class, users will be prepared to understand more complex mechanical systems.	Week 1
Hand Tools and Shop Equipment	40
This course is an introduction to safety, maintenance, and operation of the equipment and tools typically found in repair shop facility. This course comprises topics including: grinder operation, wheel inspection and dressing, and rest plate adjustment. Additional topics include: the drill press, properly securing the work piece, drill bit speed for various materials, abrasive saw inspection, band saw inspection, and proper methods of cutting.	Week 2
Precision Measurement	40
This course is an introduction to craft level math and use of precision measurement instruments. This course comprises topics including: fractions, decimals, conversions, right triangle geometry, applications, tolerances, areas and volumes, weights, pump curves, square corners, shaft alignment, dynamic balancing, hydraulic force, and pressure. Additional topics include: measurement tools, scales, micrometers, and vernier scales.	Week 3
Basic Rigging, Inspection and Signaling	32
This course introduces the concepts of rigging and crane safety. This course comprises topics including: calculating the loading on various rigging components in the lift, choosing correctly rated components, understanding component limitations, load weight, balance, and rigging geometry effects. Additional topics include: planning a lift, signals, slings, hitches, hardware, chains, wire rope, inspection and maintenance of rigging equipment.	Week 4



Mechanical Maintenance Program

Course Description	Contact Hours
Burning and Welding	40
This course is an introduction to burning and welding theory. Emphasis is placed on safety, and proper handling of gas cylinders. Topics include: welding preparation, rod selection and identification, post welding procedures such as preening and post heating, fuel and oxygen pressure settings, and other related topics.	Week 5
Critical Inspection Requirements	40
This course is an introduction to critical inspections and their regulatory requirements. Topics include: structural, crane, and lifting device inspections, regulatory requirements regarding what to inspect and when to inspect it are covered, common structures and components are reviewed, failure modes, what to inspect for on common structures and equipment components.	Week 6
Fasteners	24
This course is an introduction to threading standards. Topics include: bolt specifications and grades, tightening and torque, tightening techniques such as heat expanding and impact driving, thread cutting and repair, methods of fastener, snap rings, pins, rivets and adhesives.	Week 7
Lubrication and Oil Analysis	40
This course is an introduction to lubrication and oil analysis. This course comprises topics including: types of lubrication systems and their maintenance requirements, ring, bath, splash, constant level, and forced feed lubrication systems, lubrication schedules, how to change common types of oil filters, and how to properly handle and store lubricants to prevent contamination. Additional topics include: oil sampling methods, preparation of the oil for analysis, and contamination materials that may indicate potential failure.	Week 8



Mechanical Maintenance Program

Course Description	Contact Hours
Bearings	40
This course provides a comprehensive coverage of bearings. Topics include: bearing types ranging from insert bearings through roller and spherical bearings, proper care and handling, proper installations including heat and forced fits as well as preloading of the bearings as required.	Week 9
Gears and Gearboxes	40
This course provides an in-depth coverage of gear boxes. Topics include: types, torque and inertia relationships on the input and output shafting, lubrication and bearings will also be addressed.	Week 10
Power Transmission	40
This course is an introduction to power transmission. Topics include: installing and maintaining mechanical drives, belts, chains, gears, proper lubrication, bearings, proper alignment, fastening techniques, troubleshooting, spotting the symptoms of failure and selection of the appropriate remedy.	Week 11
Reading Mechanical Drawings	40
This course is an introduction to the fundamentals essential for reading and interpreting Basic Mechanical Prints. This course comprises topics involving: drawing tools, measurement tools, tolerances, clearances and fits, types of drawings/prints, types of material, bolts and fasteners, and types of gearing and couplings. Additional topic include: symbols, piping and instrument diagrams, hydraulic prints and pneumatic prints.	Week 12
Energy Control	40
This course covers the recognition of all forms of stored energy that are a danger. Topics include: methods of isolation and removal of hazards, methods of documentation and coordination of activities with multiple craft involvement.	Week 13



Mechanical Maintenance Program

Course Description	Contact Hours
Basic Machine Alignment	40
This course is an introduction to alignment from the foundation to final operation of the equipment. This course comprises topics including: measurement tools, alignment exercises using a straight edge, alignment using dial indicators, and alignment using a laser. Additional topics will include: elements of rigging and power transmission.	Week 14
Vibration and Balance	16
This is an introductory level course in vibration monitoring theory. This course comprises topics including: displacement, velocity, acceleration measurements, and selection of monitoring methods as impacted by equipment mass and speed. Additional topics include: vibration as a predictive maintenance tool, the importance of balancing, and balancing techniques.	Week 15
Materials, Fits and Finishes	40
This course is an extensive coverage of the properties of the materials commonly used in industrial equipment. The characteristics of steel will be of particular importance. This course comprises topics including: strength, hardness, thermal expansion, grades, wear, weld-ability, machine-ability, and stress/strain. Additional topics include: fits and clearances, and the importance of finishing requirements for specific applications.	Week 16
Pipefitting	16
The course includes coverage of the most widely accepted materials used for pipe, fittings, and valves. The participant will learn how to use the tools of the trades, with emphasis on safety. This course comprises topics including: the methods used to join pipe, the procedures for supporting, installing, and testing piping systems. Additional topics include: common plumbing fixtures, installation and maintenance, and a review of tanks, pumps, and boilers.	Week 17



Mechanical Maintenance Program	
Course Description	
Pumps, Packing and Seals	24
This course explains pumps and their operation. This course comprises topics including: reciprocating pumps, rotary pumps, special-purpose pumps, diaphragm pumps, and pumps used for corrosive or abrasive materials. Additional topics include: the maintenance of pumps, the replacement of packing glands, seals, and bearings.	Week 18
Valves / Regulators	16
This course is an introduction to valves used in industry. This course comprises topics including: construction, best uses, limitations, gate valves, globe valves, ball valves, diaphragm valves, disc valves, butterfly valves, and check valves. Additional topics include: seats, trim, materials, actuators, regulating pressures and flows.	Week 19
Basic Hydraulics and Pneumatics	40
This course introduces basic hydraulic principles and laws, along with detailed descriptions of the theory and operation of all essential components. This course comprises topics including: types of hydraulic fluids and their characteristics, components of the hydraulic system and their functions, filters, strainers, reservoirs, accumulators, pumps, piping, tubing, hoses, control valves, relief valves, actuating devices, cylinders, and hydraulic motors. Additional topics include: Hydraulic and pneumatic components, power requirements, maintenance practices, troubleshooting, and construction.	Week 20
Curriculum Total	Hours
Total curriculum hours over a 20-month period:	688

Customized programs to meet your needs as well as flexible and “fast-track” scheduling are available.

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Course Registration Form

Registrations are accepted online at www.crowntraining.com, by phone (219) 947-0845, or by completing and faxing this form to: (219) 945-1868

Company/Student Information

Student(s): _____

Company Name: _____

Address: _____

_____ *Street Address* _____ *Unit/Suite/M.S.*

_____ *City* _____ *State* _____ *ZIP Code*

Work Phone: () _____ Fax Number: () _____

E-mail Address: _____

Supervisor/Contact Name: _____

Phone Number: () _____ E-mail Address: _____

Course Information

Course Title: _____

Course Date: _____

Cost of Course: _____ X Number of Students: _____ = Total Cost: _____

Payment Information

Credit Card #: _____ Expiration: _____

3 Digit Code: _____

☐ American Express ☐ Discover ☐ MasterCard ☐ Visa

_____ *Card Holder's Name* _____ *Card Holder's Signature*

Purchase Order: _____

_____ *Number*

Class Size is limited. Please register at least one week prior to the course. No cancellation charges will be made if Crown Training and Development is notified more than one week prior to the start of class. Fees include refreshments, lunch, and all necessary course manuals and materials. All catalog classes are held at Crown Training and Development, Inc., unless requested otherwise. Crown Training and Development, Inc. reserves the right to change prices, cancel and/or reschedule any classes. Customized and/or on-site training is also available upon request. Please call for details.



Driving Directions

Crown Training & Development, Inc.
2642 East 84th Place, Merrillville, IN 46410
Phone: 219-947-0845 Fax: 219-945-1868

From Indianapolis: Take I-65 North to exit 253A turn onto ramp towards US 30 (East) take to Colorado Street (Xfinity store on right) turn right. Turn right at 84th Place. Take 84th Place approximately ½ mile and then turn right into CT&D complex.

From South Bend: Take I-80 (I-94) West. At I-80 Exit 12A turn onto ramp towards I-65 Indianapolis. Merge onto I-65 (South-West). At I-65 exit 253A, turn onto ramp towards US 30 (East) take to Colorado Street (Xfinity store on right) turn right. Turn right at 84th Place. Take 84th Place approximately ½ mile and then turn right into CT&D complex.

From Chicago: Take I-294 or I-94 South to I-80/94 East to I-65 South in Indiana. At I-65 exit 253A, turn onto ramp towards US 30 (East) take to Colorado Street (Xfinity store on right) turn right. Turn right at 84th Place. Take 84th Place approximately ½ mile and then turn right into CT&D complex.

Lodging Options:

Comfort Suites Merrillville

1344 E. 83rd Ave.
Merrillville, IN.
219-736-9500

Hilton Garden Inn Merrillville

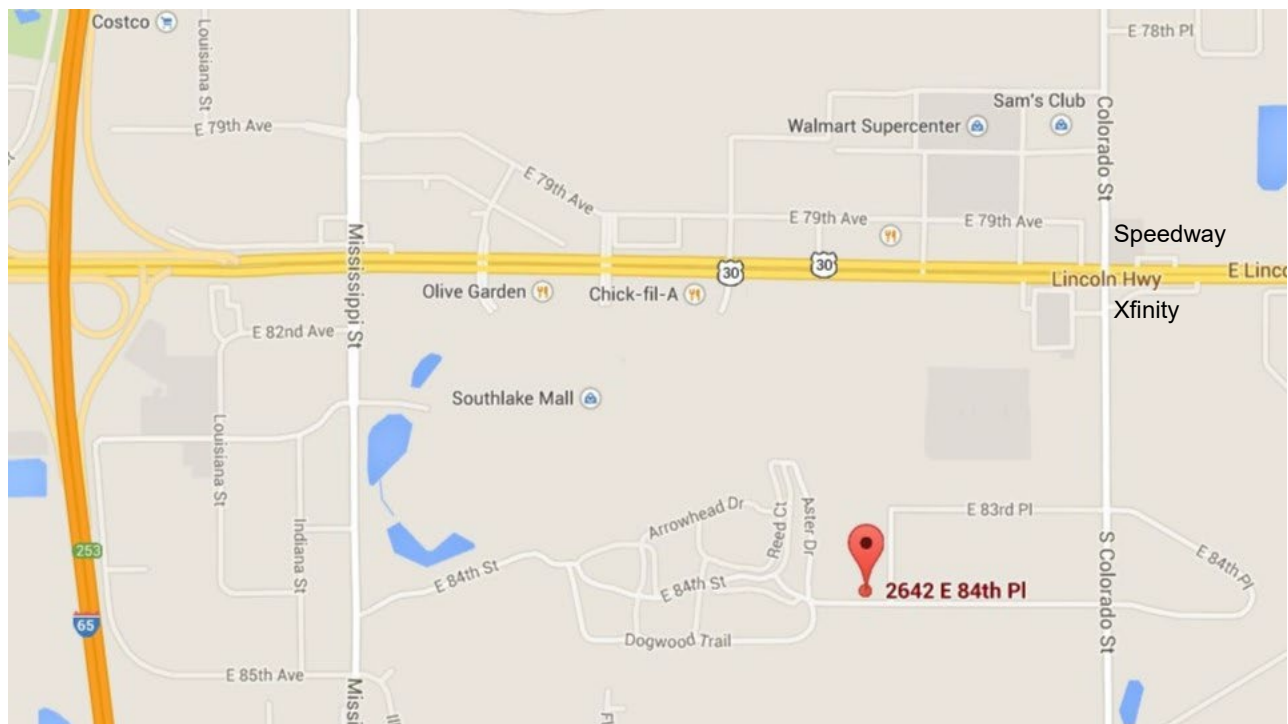
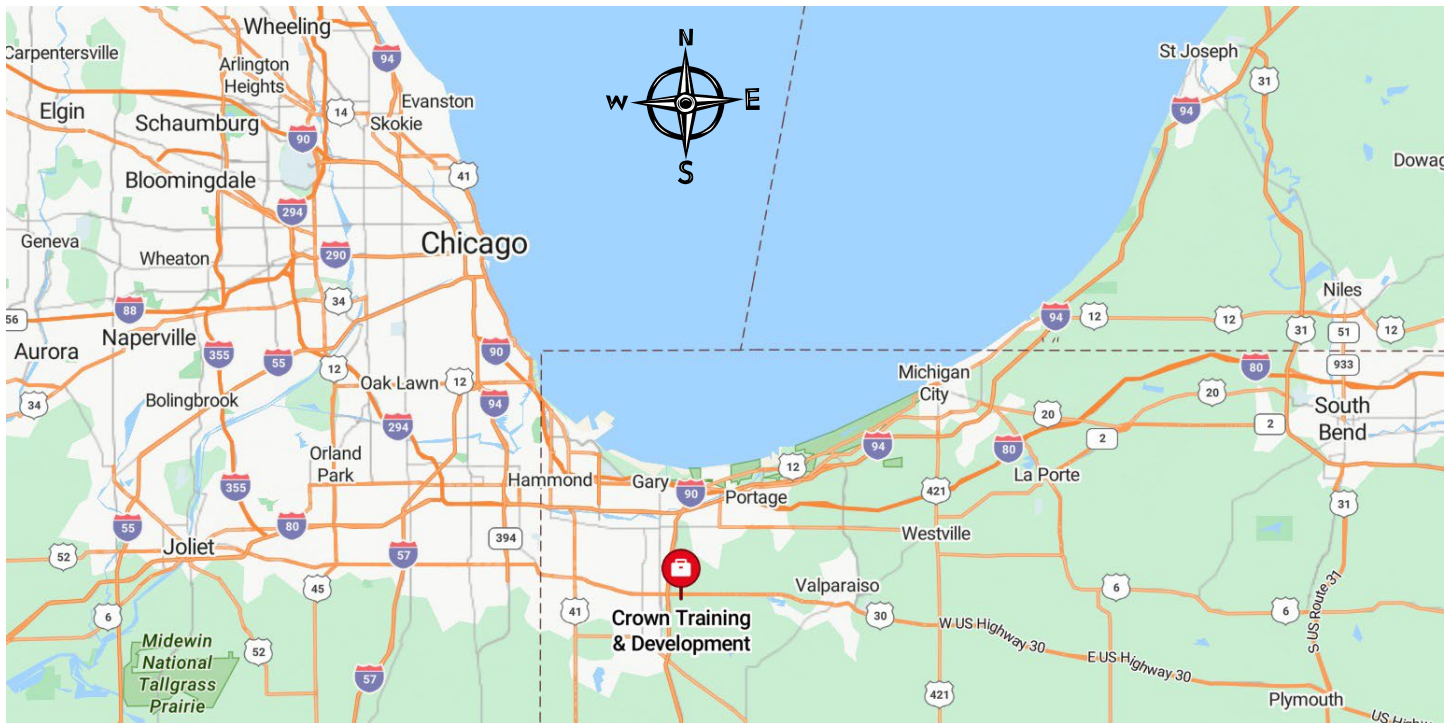
7775 Mississippi St.
Merrillville, IN.
219-769-7100

Holiday Inn Express & Suites Merrillville

8460 Mississippi St.
Merrillville, IN.
219-472-1200



Map



NEED SAFETY OR INDUSTRIAL APPAREL?



ITEM #: SLDTLB
**Mid-weight FR Enhanced
Visibility Uniform Shirt**

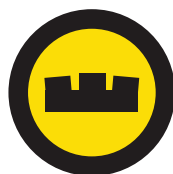


ITEM #: PEJ4
**Classic Heavyweight
FR Jeans**



ITEM#: CED2NV
**Mid-weight FR Deluxe Coverall
CAT2**

CONTACT US TO PLACE YOUR ORDER!



CROWN
TRAINING & DEVELOPMENT, INC.

2642 E. 84TH PLACE | MERRILLVILLE, IN | P: (219) 947-0845 | F: (219) 945-1868

WWW.CROWNTRAINING.COM