

Skills Gap Training - Safety and Manufacturing Course Descriptions

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HEALTH & SAFETY SKILLS

HEALTH & SAFETY SKILLS COURSES

Introduction to Safety

SAF-1001 Introduction to OSHA

Course Description

Before the 1970s, workplace accidents were common. The OSH Act was the first national standard to address workplace health and safety. This act created the Occupational Safety and Health Administration (OSHA), an organization that guarantees the rights of employees to a safe workplace.

By the end of this course, you will be able to

- Describe OSHA's role in workplace safety
- Know who OSHA does and does not cover
- List employee and employer rights under OSHA
- Understand what an OSHA standard is

Estimated completion time (hours): 1.1

Introduction to Safety

SAF-1002 Making Work a Safer Place

Course Description

Conducting a thorough job hazard analysis can make work a much safer place for employees. OSHA inspections also help prevent dangers and protect workers. However, workplace safety isn't only affected by on-the-job hazards. Employee behavior plays a huge role as well.

By the end of this course, you will be able to

- Understand the job hazard analysis process
- Know each step of an OSHA inspection
- Identify the different types of citations and penalties
- Know where to find more safety information
- Recognize guidelines for preventing workplace violence
- Spot substance abuse issues

Estimated completion time (hours): 1.6

Introduction to Safety

SAF-1003 Help! What to Do in an Emergency

Course Description

Emergencies are never expected, and chaos can quickly ensue. That's why it's important to establish an emergency action plan before a crisis occurs. When an emergency does happen, someone needs to be available to administer first aid. Employees also need to know how to prevent exposure to blood borne pathogens.

By the end of this course, you will be able to

- Develop an emergency action plan
- Know where to find first-aid training
- Control your exposure to blood borne pathogens

Estimated completion time (hours): 1.2

Personal Protective Equipment Safety

SAF-1004 Personal Protective Equipment

Course Description

Personal protective equipment (PPE) plays an important role in worker safety. Worn properly, personal protective equipment can minimize your exposure to many workplace hazards.

By the end of this course, you will be able to

- Apply the Hierarchy of Controls
- Understand both employer and employee responsibilities
- Conduct a hazard assessment
- Identify the different types of personal protective equipment

Estimated completion time (hours): 1.5

Personal Protective Equipment Safety

SAF-1005 Eye and Face Protection

Course Description

Many workplace injuries are the result of eye and face hazards. Flying shards, chemicals, and bright light are just a few examples of workplace hazards that can cause injury.

By the end of this course, you will be able to

- Recognize potential eye and face hazards
- Understand employer responsibilities
- Explain common types of eye and face protection
- Follow guidelines to protect your eyes and face

Estimated completion time (hours): 1.0

Personal Protective Equipment Safety

SAF-1006 Head Protection

Course Description

Head injuries aren't to be taken lightly. Their effects can haunt you for the rest of your life and may even be fatal. Fortunately, proper hard hats can protect you from many types of head hazards.

By the end of this course, you will be able to

- Identify types of head hazards
- Know the guidelines to protect your head
- Choose the appropriate hard hat

Estimated completion time (hours): 0.9

Personal Protective Equipment Safety

SAF-1007 Foot and Leg Protection

Course Description

Foot and leg injuries are very common in manufacturing, but you can take advantage of PPE to minimize your exposure to workplace hazards. Foot and leg PPE, such as safety shoes and toe guards, can help protect you from workplace hazards.

By the end of this course, you will be able to

- Identify types of foot hazards
- Follow guidelines to protect your feet
- Match your shoe protection to the hazard

Estimated completion time (hours): 0.9

Personal Protective Equipment Safety

SAF-1008 Hand and Arm Protection

Course Description

If workers face potential injury to their hands and employers can't eliminate the workplace hazard through engineering and work practice controls, then employees need to wear PPE. PPE, such as arm coverings and gloves, help protect workers' hands from chemicals and other workplace hazards.

By the end of this course, you will be able to

- Identify types of hand hazards
- Know the guidelines for protecting your hands
- Be familiar with different types of hand PPE

Estimated completion time (hours): 1.1

Personal Protective Equipment Safety

SAF-1009 Body Protection

Course Description

Protective clothing can help keep you safe from workplace hazards that can cause bodily injury while performing your job.

By the end of this course, you will be able to

- Be aware of body hazards
- Identify the types of protective clothing for your body
- Follow safety guidelines for wearing clothing in the workplace

Estimated completion time (hours): 0.8

Personal Protective Equipment Safety

SAF-1010 Hearing Protection

Course Description

Loud noises can cause permanent hearing damage, as well as physical and psychological stress. As a result, whenever you risk exposure to excessive levels of noise, you need to wear proper PPE to protect your hearing.

By the end of this course, you will be able to

- Recognize the need for hearing protection
- Follow guidelines to reduce the amount of noise exposure
- Choose appropriate hearing PPE
- Know how to use hearing PPE

Estimated completion time (hours): 0.9

Personal Protective Equipment Safety

SAF-1011 Respiratory Protection

Course Description

Breathing air contaminated with workplace hazards can cause injury and illness. Respiratory equipment helps filter and purify air so that you can breathe clean air.

By the end of this course, you will be able to

- Recognize respiratory hazards
- Identify the different types of respiratory equipment
- Follow the guidelines for respiratory protection

Estimated completion time (hours): 1.2

Hazardous Material Safety

SAF-1012 Hazardous Materials

Course Description

Hazardous materials are present in many forms in the manufacturing workplace. The first step to protect yourself is to recognize the chemicals that create potential hazards in your work environment.

By the end of this course, you will be able to

- Describe what a hazardous material is and why it's important
- Identify the different forms of toxic materials
- Recognize the entry routes of hazardous materials

Estimated completion time (hours): 1.5

Hazardous Material Safety

SAF-1013 HazCom

Course Description

In 2012, OSHA updated its Hazard Communication Standard (HazCom) to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS). In HazCom 2012, a material safety data sheet (MSDS) is simply a safety data sheet, and labels now have a consistent look, complete with pictograms.

By the end of this course, you will be able to

- Identify the major changes to the HazCom
- Understand the new label requirements
- Explain each section of the new safety data sheet
- Know what your employer's responsibilities are

Estimated completion time (hours): 1.4

Hazardous Material Safety

SAF-1014 Hazardous Waste

Course Description

Improper dumping of hazardous waste is a serious issue. OSHA's Hazardous Waste Operations and Emergency Response (HAZWOPER) standard outlines how to handle hazardous waste operations and emergency response.

By the end of this course, you will be able to

- Define hazardous waste
- Describe the requirements of HAZWOPER
- Explain what an emergency response plan covers

Estimated completion time (hours): 0.7

Hazardous Material Safety

SAF-1015 Hazard Material Storage

Course Description

Proper storage of hazardous materials is critical to the safety of everyone. Improperly stored hazardous materials could lead to serious injury or even death.

By the end of this course, you will be able to

- Define hazardous material
- Understand the terms flash point and boiling point of liquids
- Distinguish between flammable and combustible liquids
- List methods of storing hazardous materials.
- List common requirements of hazardous material storage rooms
- List common requirements of hazardous material storage cabinets

Estimated completion time (hours): 0.8

Workplace Safety

SAF-1016 Work Area Safety

Course Description

Work area safety can be greatly improved by paying attention to little things that may be overlooked. A clean, organized work area, wide, clear walkways, and proper lifting techniques go a long way toward keeping you safe on the job.

By the end of this course, you will be able to

- Understand the importance of housekeeping
- Identify walkways and exits
- Create an ergonomic work environment
- Maintain a correct, neutral posture
- Use proper lifting techniques

Estimated completion time (hours): 1.2

Workplace Safety

SAF-1017 Permit-Related Safety

Course Description

Confined spaces present some unique hazards that you normally wouldn't encounter in an open workplace. As a result, some confined spaces require that workers have permits to work in them. However, an entry permit doesn't make unsafe work safe.

By the end of this course, you will be able to

- Describe a confined space
- Recognize hazards in a confined space
- Follow guidelines for working in a permit space
- Understand the importance of an entry permit
- Identify the types of entry permits

Estimated completion time (hours): 1.0

Workplace Safety

SAF-1018 Fall Prevention

Course Description

Falls are one of the most common causes of workplace injuries and fatalities. Employers can reduce the risk of falling from elevated surfaces by providing fall protection equipment. In addition, you, as an employee, can minimize the risk of falling by following simple safety guidelines.

By the end of this course, you will be able to

- Know the steps employers must take to prevent falls
- Identify fall protection systems
- Follow safety guidelines for scaffold work
- Stay safe when working on an aerial lift

Estimated completion time (hours): 1.3

Workplace Safety

SAF-1019 Ladder Safety

Course Description

Many types of ladders are available. Because you run the risk of falling any time you're working at an elevated height, it's important to choose the correct ladder for the job. You also need to follow ladder safety guidelines to reduce your risk of injury.

By the end of this course, you will be able to

- Identify the different types of ladders
- Follow ladder safety guidelines
- Inspect a ladder
- Climb a ladder using three-point contact
- Set up a ladder correctly

Estimated completion time (hours): 1.1

Electrical and Fire Safety

SAF-1020 Electrical Safety

Course Description

Working with electricity can be dangerous, whether you're working with it directly or indirectly. However, with a healthy respect for electricity and a basic understanding of how it works, you can take precautions to protect yourself from electrical hazards.

By the end of this course, you will be able to

- Understand how electricity works
- Identify electrical hazards
- Apply electrical safety guidelines

Estimated completion time (hours): 1.4

Electrical and Fire Safety

SAF-1021 Lockout/Tagout

Course Description

If a device starts up unexpectedly, you can be severely injured. Fortunately, lockout/tagout procedures prevent devices from accidentally starting up. As long as the processes are followed correctly, lockout/tagout procedures play a valuable role in protecting you from workplace hazards.

By the end of this course, you will be able to

- Understand the lockout/tagout process
- Identify the main components of an electrical and a pneumatic lockout/tagout
- Follow the steps to perform an electrical lockout/tagout
- Complete a pneumatic lockout/tagout

Estimated completion time (hours): 1.0

Electrical and Fire Safety

SAF-1022 Fire Safety

Course Description

A workplace fire can have nightmarish consequences. To avoid tragic results, employers need to train their employees on fire hazards in the workplace and what to do in case a fire does occur.

By the end of this course, you will be able to

- Know how a fire starts
- Explain the difference between the classes of fire
- Apply fire safety guidelines
- Practice a fire drill

Estimated completion time (hours): 0.9

Electrical and Fire Safety

SAF-1023 Fire Extinguishers

Course Description

Selecting the wrong type of fire extinguisher for a fire or using it incorrectly can make a bad situation worse. Using a fire extinguisher isn't just about picking up the nearest one and using it to fight a fire. Selecting the right fire extinguisher for the fire and following the PASS sequence can make a big difference in your firefighting success.

By the end of this course, you will be able to

- Understand how a fire extinguisher works
- Match a fire extinguisher to a class of fire
- Use a fire extinguisher

Estimated completion time (hours): 0.9

Material Handling Safety

SAF-1024 Material Handling Basics

Course Description

Material handling plays an important role in today's workplace. It involves moving physical objects from one location to another. However, handling and storing materials isn't without risk. In fact, mishandling materials is the single largest cause of accidents and injuries in the workplace. Recognizing potential hazards and following basic safety precautions can help reduce the likelihood of injuries or fatalities.

By the end of this course, you will be able to

- Identify potential hazards
- Follow guidelines to safely move materials
- Stack and store materials

Estimated completion time (hours): 1.0

Material Handling Safety

SAF-1025 Powered Industrial Trucks

Course Description

At times, employees will need to move materials mechanically. To reduce the number of accidents associated with workplace equipment, employers must train employees on how to safely and effectively use this equipment. In this course, you will discover how you can safely use conveyors and powered industrial trucks to move and store materials.

By the end of this course, you will be able to

- Safely move material using conveyors
- Identify the different classes of powered industrial trucks
- Recognize the hazards associated with forklifts
- Know how to safely operate forklifts and powered industrial trucks

Estimated completion time (hours): 0.9

Material Handling Safety

SAF-1026 Crane and Rigging Safety

Course Description

Cranes can help you lift, lower, and move heavy loads. Although cranes are a great help when moving materials mechanically, they also come with their own set of safety hazards. In this course, you will discover how to safely use cranes and slings to move and store materials.

By the end of this course, you will be able to

- Follow safety guidelines to operate a crane
- Use rigging equipment to lift a load
- Identify common sling configurations
- Properly care for and use slings

Estimated completion time (hours): 1.3

Tool and Machine Safety

SAF-1027 Hand Tool Safety

Course Description

No matter which manufacturing subindustry you work in, more than likely your job involves working with tools. Whenever you work with hand and cutting tools, you need to follow certain safety guidelines to avoid workplace accidents.

By the end of this course, you will be able to

- Identify tool hazards
- Explain hand tool safety guidelines
- Follow cutting tool safety guidelines
- Maintain hand tools

Estimated completion time (hours): 1.0

Tool and Machine Safety

SAF-1028 Power Tool Safety

Course Description

Power tools require a few more safety precautions than hand tools. Following additional guidelines when working with all types of power tools goes a long way toward keeping you safe in the workplace.

By the end of this course, you will be able to

- Understand how guards and safety devices work
- Identify power tool hazards
- Explain power tool safety guidelines
- Protect yourself while working with electric tools
- Follow pneumatic tool safety guidelines

Estimated completion time (hours): 1.1

Tool and Machine Safety

SAF-1029 Sheet Metal and Compressed Gas Safety

Course Description

Working with sheet metal can be dangerous due to the nature of the material. Welding and cutting sheet metal involves using compressed gases to produce a high temperature flame.

In this course, you will discover everything you need to know to safely work with sheet metal and compressed gases.

By the end of this course, you will be able to

- Know sheet metal safety guidelines
- Follow safety guidelines to store, use, and transport compressed gas cylinders

Estimated completion time (hours): 0.8

Tool and Machine Safety

SAF-1030 Machine Safety

Course Description

Whenever you use machines, you risk machinery-related injuries, such as crushed hands, severed limbs, and blindness. However, you can follow safety guidelines and use machine guards to help protect yourself from dangerous machine motions and action.

By the end of this course, you will be able to

- Describe clothing safety guidelines

- Follow machine operation safety guidelines
- Identify hazardous mechanical motions and actions
- Understand the requirements for safeguards

Estimated completion time (hours): 1.3

Tool and Machine Safety

SAF-1031 Safety Devices

Course Description

Different types of safety devices help prevent injury while operating a machine. Each type of safety device plays a special role in keeping you safe, whether it's by stopping the machine or preventing your hands from reaching into a certain area while the machine is operating.

By the end of this course, you will be able to

- Explain the general types of safety devices
- Recognize the limitations of each type of safety device
- Understand how an emergency stop device works

Estimated completion time (hours): 1.0

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CONTINUOUS IMPROVEMENT SKILLS

LEAN MANUFACTURING SKILLS COURSES

Lean Principles

LEA-1001 Lean Principles

Course Description

Lean principles are designed to help an organization achieve process perfection. The foundation of lean principles are employee involvement, adding the maximum value, and the elimination of waste. Lean is a journey toward understanding the customer and their needs.

By the end of this course, you will be able to

- Define and describe the concepts of lean, including pull and perfection
- Define and describe the elimination of waste using tools like 5S, kaizen, and poke-yoke
- Use a value stream map to identify waste
- Explain value
- Define value, value-added, and non-value-added
- Identify the terms used to describe waste
- Describe the theory of constraints

Estimated completion time (hours): 1.5

Introduction to Lean Manufacturing

LEA-1002 The History of Lean Manufacturing

Course Description

In this course, you'll learn about the history of lean manufacturing. You'll discover how the contributions of Henry Ford, Taiichi Ohno, and Shigeo Shingo worked together to form what is today called lean manufacturing. You'll also find out about the three essential elements of the Toyota Production System.

By the end of this course, you will be able to

- List the major contributions in the history of lean manufacturing
- Identify the principles and practices of using lean manufacturing
- Name the three essential elements of the Toyota Production System

Estimated completion time (hours): 0.9

Workplace Organization

LEA-1003 Workplace Organization

Course Description

A disorganized work area not only makes it hard to find items, but it makes working effectively

and efficiently difficult as well. In this course, you'll learn about the importance of workplace organization, the methods used to organize the workplace, and the 5S program.

By the end of this course, you will be able to

- List the principles of workplace organization
- Identify the methods used to organize the workplace
- Recognize the methods used to measure workplace organization

Estimated completion time (hours): 1.1

Workplace Organization

LEA-1004 S1: Sort

Course Description

In this course, you'll learn about the process of Sort. Sort involves getting rid of unnecessary items and general clutter in the work area. Sort helps ensure that only necessary items remain in the workplace.

By the end of this course, you will be able to

- Define the 5S meaning of Sort
- Match Sort with its requirements and compliance activity
- Identify key actions for Sort
- Explain how Sort is executed in the workplace

Estimated completion time (hours): 0.7

Workplace Organization

LEA-1005 S2: Straighten

Course Description

In this course, you will learn about Straighten. Straighten is a method for organizing the workplace to reduce wasted steps, motion, and time. You'll explore techniques designed to help you store tools where they're needed and visually obvious. You'll also learn to use outlines and labels to identify the location of machines, walkways, and storage areas.

By the end of this course, you will be able to

- Define the 5S meaning of Straighten
- Match Straighten with its requirements and compliance activity
- Identify key actions for Straighten
- Explain how Straighten is executed in the workplace

Estimated completion time (hours): 0.9

Workplace Organization

LEA-1006 S3: Shine

Course Description

In this course, you will learn to Shine. Shine is maintaining order through cleaning. Daily cleaning routines are established to maintain a clean and tidy working environment. You'll explore steps for keeping equipment clean and in good working order.

By the end of this course, you will be able to

- Define the 5S meaning of Shine
- Match Shine with its requirements and compliance activity
- Identify key actions for Shine
- Explain how Shine is executed in the workplace

Estimated completion time (hours): 0.8

Workplace Organization

LEA-1007 S4: Standardize

Course Description

In this course, you will learn about standardizing the Sort, Straighten, and Shine activities. You'll also discover basic guidance on how to keep the 5S effort active in your organization.

By the end of this course, you will be able to

- Match Standardize with its requirements and compliance activity
- Identify the key actions for Standardize
- Explain how Standardize is executed in the workplace

Estimated completion time (hours): 0.7

Workplace Organization

LEA-1008 S5: Sustain

Course Description

The last step of 5S, Sustain, is considered the most difficult step of the 5S process. Sustain is defined as the training and discipline needed to maintain 5S. In this course, you'll learn why sustaining the 5S effort takes so much work and commitment by everyone.

By the end of this course, you will be able to

- Understand Sustain requirements and compliance activity
- Identify the key action steps for Sustain
- Explain how Sustain is executed in the workplace

Estimated completion time (hours): 0.7

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QUALITY SKILLS COURSES

Quality Systems

QUA-1001 Introduction to Quality

Course Description

Quality is a term that's mentioned often, but what does it really mean? This course defines terms, like quality and Total Quality Management (TQM), and how these terms apply to manufacturing companies.

By the end of this course, you will be able to

- Define quality, customer, and expectations
- Identify the source of expectations
- Define quality management systems
- Describe the history of quality management systems
- Define Total Quality Management (TQM)
- List the principles of TQM
- Identify who is involved in quality
- Give examples of how customers and companies benefit from quality systems

Estimated completion time (hours): 1.4

Quality Systems

QUA-1002 ISO 9000

Course Description

International standards are a way of overcoming technical barriers to global trade. The most prominent organization that develops these standards is the International Organization for Standardization (ISO).

By the end of this course, you will be able to

- Describe the International Organization for Standardization (ISO)
- Define ISO standard
- Describe the Plan, Do, Check, Act (PDCA) cycle as applied to ISO standards
- State the goals of ISO 9001:2000
- Describe some of the industries impacted by ISO standards

Estimated completion time (hours): 1.1

Quality Systems

QUA-1003 Standards Organizations

Course Description

Standards organizations develop, coordinate, distribute, revise, issue, interpret, and otherwise produce standards intended to address the needs of affected adopters.

By the end of this course, you will be able to

- Define standards
- Define technical standards
- Define standards organizations
- Describe the uses of standards
- State the purpose of international standards

Estimated completion time (hours): 0.9

Quality Systems

QUA-1004 Quality Organizations

Course Description

Implementing a quality system requires a support organization that spans the entire company. The organizational structure reflects the company structure and the requirements of the products being produced.

By the end of this course, you will be able to

- Define quality organization
- Describe where a quality system comes from
- Identify the four levels of quality documentation
- Identify some typical parts of a quality organization
- Discuss the roles and the challenges quality organizations face
- Explain why quality personnel must be independent

Estimated completion time (hours): 0.9

Quality Systems

QUA-1005 Basic Quality Roles and Responsibilities

Course Description

Quality assurance is a company-wide effort with responsibilities extending to every employee. Within a company's quality program, there are a few basic roles with responsibilities that must be fulfilled.

By the end of this course, you will be able to

- Define role
- Define responsibilities
- Define fulfillment of requirements
- Describe the roles and responsibilities of Quality Assurance personnel
- Define inspection
- Describe the inspection process

Estimated completion time (hours): 1.0

Quality Management

QUA-1006 Quality Concepts

Course Description

Quality is based on the wants, needs, and expectations of the customer. In this course, you will be introduced to the concepts of product quality, the types of customers and how to meet their expectations.

By the end of this course, you will be able to

- Define product quality
- Identify the difference between internal and external customers
- Define specification
- Define tolerance and explain its importance
- Identify the roles of management and production workers regarding quality
- Describe how quality teams work

Estimated completion time (hours): 0.9

Quality Management

QUA-1007 The Cost of Quality

Course Description

Producing quality products costs money. Where the company spends money producing quality products is an indicator of their commitment to the customer and to the long-term sustainability of the company.

By the end of this course, you will be able to:

- Define the cost of quality
- Categorize quality activities into one of the four classifications of quality
- Differentiate between prevention and appraisal costs
- Explain the difference between internal and external failure costs
- Describe the Six Sigma quality system

Estimated completion time (hours): 0.9

Quality Management

QUA-1008 Managing Quality

Course Description

Quality planning, quality control, and quality improvement are essential to the success of a quality program. Organizations that are serious about quality have robust quality management systems to ensure these activities are properly supported and implemented.

By the end of this course, you will be able to:

- Define the three key elements of quality and explain how they are related
- Define quality planning
- Define quality control
- Define quality improvement
- Explain the impact of quality improvement on productivity
- Explain the importance of data collection and analysis to quality
- Describe quality audit

Estimated completion time (hours): 1.1

Quality Management

QUA-1009 Quality Documents

Course Description

The heart of any quality system is documentation. Documents tell you how and when to perform tasks, and they also serve as a permanent record that the tasks were completed. In this course, you will learn the purpose and types of documentation used in a quality system.

By the end of this course, you will be able to

- Identify the levels of documentation in a quality system
- Describe the purpose of a policy
- Describe the purpose of a procedure
- Describe the purpose of a work instruction
- Define document control
- Describe a technical manual
- Identify the benefits of electronic data interchange

Estimated completion time (hours): 0.9

Quality Management

QUA-1010 Corrective and Preventive Action

Course Description

Corrective and preventive actions are designed to eliminate the causes of nonconformities. They are a requirement of ISO 9000 and many other quality systems.

By the end of this course, you will be able to

- Explain the difference between corrective and preventive action
- List the steps of the corrective action process
- Explain the importance of the corrective action report
- Define the purpose of a Material Review Board

Estimated completion time (hours): 0.8

Introduction to Statistical Process Control

QUA-1011 Introduction to SPC

Course Description

Statistical Process Control, or SPC, is a quality control methodology that uses statistics to predict variation in processes. Developed in the 1920s, SPC is widely used by manufacturing companies to maintain the quality of the products they produce.

By the end of this course, you will be able to

- Define statistical process control
- Identify and explain the three basics of statistical process control
- Explain the types of variation that exist in a process
- Explain the history of statistical process control

Estimated completion time (hours): 1.0

Introduction Statistical Process Control

QUA-1012 Probability and Variation

Course Description

Probability and variations are the foundation of SPC. The mathematical rules of probability can help to accurately predict the variation in any process.

By the end of this course, you will be able to

- Identify the different types of variation
- Define and explain the six common causes of variation
- Explain the principles of probability
- Calculate the probability of an event
- Construct a histogram
- Explain the concepts of standard deviation

Estimated completion time (hours): 1.8

Introduction Statistical Process Control

QUA-1013 The Control Chart

Course Description

The control chart is a tool used in Statistical Process Control to determine if a manufacturing process is in a state of statistical control. Control charts achieve this by comparing real-time process information with historical process data.

By the end of this course, you will be able to

- Define the purpose of a control chart
- Explain the fields on a control chart
- Prepare a new control chart
- Calculate X-bar
- Calculate X-double bar
- Calculate R-bar

Estimated completion time (hours): 1.2

Advanced Statistical Process Control

QUA-2001 Control Chart Analysis

Course Description

Analyzing the data on your control chart will help you keep your processes in a state of statistical control. This course provides a few rules and guidelines that will help you identify potential problems before the process creates defective products.

By the end of this course, you will be able to

- Prepare a control chart for analysis
- Explain the eight basic control chart tests
- Analyze the averages chart
- Analyze the range chart

Estimated completion time (hours): 0.9

Advanced Statistical Process Control

QUA-2002 Process Capability

Course Description

Process capability is a measure of the ability of a process to produce products that meet or exceed the engineering requirements. It is the standard for evaluating the statistical capability of a manufacturing process.

By the end of this course, you will be able to

- Define process capability
- Define specification limits
- Calculate process capability
- Calculate the process capability index
- Explain how the location of the process mean impacts process capability

Estimated completion time (hours): 1.0

Advanced Statistical Process Control

QUA-2003 Problem Solving Tools

Course Description

Problem solving tools are used to identify the root causes of problems in a process. They are designed to create a methodical path towards problem resolution.

By the end of this course, you will be able to

- List the seven quality control tools
- Define and explain the seven basic quality tools
- Create a cause-and-effect diagram
- Create a check sheet
- Create a histogram
- Create a pareto chart
- Create basic graphs

Estimated completion time (hours): 1.1

Advanced Statistical Process Control

QUA-2004 Problem Solving

Course Description

Problem solving is one of the most difficult things you will ever do. It requires a strong mind, willpower, and knowledge of problem solving processes to get to the root cause of difficult problems.

By the end of this course, you will be able to

- Explain the Plan, Do, Check, Act cycle
- Define the required tasks for each step of the Plan, Do, Check, Act cycle
- Identify how the seven quality tools are used in the Plan, Do, Check, Act Cycle

Estimated completion time (hours): 0.9

Six Sigma and the Organization

QUA-3001 Six Sigma and the Organization

Course Description

Six Sigma is the structured, disciplined pursuit of near perfection in the products or services an organization produces.

It is based on statistical techniques and tools, and attempts to improve an organization's bottom line by eliminating the variation in business processes that can result in defects.

By the end of this course, you will be able to

- Define the origins of Six Sigma
- Recognize why organizations use Six Sigma
- Explain how they apply its philosophy and goals
- Describe how process inputs, outputs, and feedback impact the larger organization
- Recognize key drivers for business and how key metrics and scorecards are developed
- Describe the project selection process
- Explain when to use Six Sigma improvement methodology as opposed to other problem-solving tools
- Explain how a project supports and is linked to organizational goals

Estimated completion time (hours): 1.9

Six Sigma and the Organization

QUA-3002 Design for Six-Sigma

Course Description

Design for Six Sigma (DFSS) is an application of Six Sigma that encompasses the

product design and redesign processes. DFSS makes certain that the voice of the customer is built into every new product and service.

By the end of this course, you will be able to

- Describe how quality function deployment fits into the overall DFSS process
- Define the purpose of the QFD
- Create a QFD matrix
- Explain the purpose of process and design failure mode and effects analyses (PFMEA and DFMEA)
- Calculate the RPN value for a PFMEA and DFMEA
- Explain the differences between a PFMEA and a DFMEA

Estimated completion time (hours): 1.0

Six Sigma Define

QUA-3003 Process Elements for Projects

Course Description

A Six Sigma project often requires a large amount of time from many people, and can be quite costly to the organization. The define portion of the DMAIC continuous improvement model provides the information and tools necessary to identify the issue causing decreased customer satisfaction, and to ensure the project will be a value-added activity.

By the end of this course, you will be able to

- Define components of processes
- Define process boundaries
- Describe the difference between internal and external customers
- Define process owner
- Define process stakeholder
- List some means of identifying customers
- Identify means for collecting customer data

Estimated completion time (hours): 1.2

Six Sigma Define

QUA-3004 Project Management Basics

Course Description

Basic project management techniques are key contributors to the success of a Six Sigma project. Creating a project charter and performing risk analysis during the define phase helps a Six Sigma project stay on target and addresses potential risks.

By the end of this course, you will be able to

- List the contents of a project charter
- Define problem statement
- Define purpose
- Define benefits
- Define scope
- Define results
- State the benefit of project risk analysis

Estimated completion time (hours): 1.1

Six Sigma Define

QUA-3005 Management and Planning Tools

Course Description

The success of a Six Sigma project depends on accurately identifying the current state of a process, and then assessing the problems within the process. A number of management and planning tools are available for this purpose.

By the end of this course, you will be able to

- Define affinity diagram
- Define interrelationship diagram
- Define tree diagram
- Define prioritization matrix
- Define PDPC
- Define activity network diagram
- Define matrix diagram
- Identify types and uses of matrix diagrams

Estimated completion time (hours): 0.7

Six Sigma Define

QUA-3006 Business Results for Improvement Projects

Course Description

To complete the define phase of a Six Sigma project, it's necessary to be able to assess its performance. Business results are measurements of performance that can be applied to the business, project, or process.

By the end of this course, you will be able to

- Define Defects per Unit (DPU)
- Define Rolled Throughput Yield (RTY)
- Define Defects per Million Opportunities (DPMO)
- Describe sigma level
- Describe process capability indices

Estimated completion time (hours): 1.1

Six Sigma Define

QUA-3007 Project Team Dynamics and Performance

Course Description

To be successful, a Six Sigma project must be executed by an effective team. Teams evolve over time, passing through definite phases of evolution until they find their place in the organization's Six Sigma structure.

By the end of this course, you will be able to

- Define and describe the stages of team evolution
- List the different roles in a Six Sigma team
- Define brainstorming
- Define nominal group technique
- Define multivoting

Estimated completion time (hours): 1.3

Six Sigma Define

QUA-3008 Problem Solving Tools

Course Description

A wide variety of tools exist for use in the define phase of a Six Sigma project. Each tool can provide insight into an organization's processes and help with the development of a good project plan.

By the end of this course, you will be able to describe the following common define phase tools:

- Surveys
- Focus groups
- Interviews
- Audits
- Cause and effect diagrams
- Check sheets
- Graphical charts
- Sampling plans
- Advanced Quality Planning (AQP)
- Benchmarking
- Force field analysis
- Gantt charts
- Project Evaluation and Review Technique (PERT)/Critical Path Method (CPM)

Estimated completion time (hours): 1.9

Six Sigma Measure

QUA-3009 Process Analysis and Documentation

Course Description

The measure portion of the DMAIC methodology provides a Six Sigma team with the tools needed to focus the project on possible causes of problems and solutions to those causes.

By the end of this course, you will be able to

- Identify and review process maps, written procedures, and work instructions
- Identify process input variables and process output variables
- Recognize the relationships between input variables and output variables

Estimated completion time (hours): 1.0

Six Sigma Measure

QUA-3010 Probability and Statistics

Course Description

In today's business world, companies cannot remain competitive if they must measure every product's weight, color, size, strength, and any other characteristic 100 percent. Organizations use probability and statistics to measure samples of a product and provide mathematical proof of the quality of the product or process.

By the end of this course, you will be able to

- Define probability
- Describe and apply probability concepts
- Define statistics
- List statistical parameters
- Distinguish between descriptive and inferential statistics
- Distinguish between a population parameter and a sample statistic
- Define a central limit theorem and its significance in statistics

Estimated completion time (hours): 2.1

Six Sigma Measure

QUA-3011 Collecting and Summarizing Data

Course Description

To improve a process or product it is important to know its current status and its status after improvements are made. Valid data must be collected and summarized to verify the status of the process or product.

By the end of this course, you will be able to

- Identify continuous or variable data
- Identify discrete or attribute data
- Describe and define nominal, ordinal, interval, and ratio measurement scales
- Define and apply methods for collecting data
- Define and apply techniques such as random sampling, stratified sampling, and sample homogeneity
- Depict relationships by constructing, applying, and interpreting diagrams and charts

Estimated completion time (hours): 1.7

Six Sigma Measure

QUA-3012 Probability Distributions

Course Description

A random experiment or sample can result in different outcomes. The probability that each outcome will occur can be calculated and charted using different probability distributions.

By the end of this course, you will be able to

- Describe and interpret normal, binomial, Poisson, t, chi square, and F distributions
- Identify formulas for calculating the probability of data values of different probability distributions

Estimated completion time (hours): 2.2

Six Sigma Measure

QUA-3013 Measurement System Analysis

Course Description

Data often consists of measurements of characteristics or conditions. A measurement system analysis is necessary to identify measurement variation and distinguish between measurement and process variation.

By the end of this course, you will be able to

- Define measurement system analysis
- Identify and conduct gauge repeatability and reproducibility studies
- Define measurement terms including sensitivity, accuracy, precision, bias, and linearity

Estimated completion time (hours): 2.5

Six Sigma Measure

QUA-3014 Process Capability Performance

Course Description

A main goal of a Six Sigma project is to reduce variation in a process. To meet this goal, the Six Sigma team must know the capability and performance of the process before and after improvements are implemented.

By the end of this course, you will be able to

- Describe the process of conducting a process capability study
- Distinguish between natural process limits and specification limits
- Define and calculate process capability indices
- Define and calculate process performance indices
- Describe the differences between short-term and long-term capability

Estimated completion time (hours): 1.9

Six Sigma Analyze

QUA-3015 Exploratory Data Analysis

Course Description

Before any problem can be eliminated or controlled, the cause of the problem must be identified and confirmed. Six Sigma teams use statistical tools to perform an analysis of data to identify and confirm the variable that causes most variation in a process or product.

By the end of this course, you will be able to

- Create and interpret multi-vari studies
- Identify the differences between positional, cyclical, and temporal variations
- Identify the largest source of variation in a process using a multi-vari study
- Interpret the linear correlation coefficient
- Determine the statistical significance of a linear correlation coefficient
- Identify the equation for linear regression

Estimated completion time (hours): 1.9

Six Sigma Analyze

QUA-3016 Hypotheses Test Basics

Course Description

Hypotheses tests are statistical methods of making decisions on the results of a study to determine if the results are truly related, or if they occur by chance. Hypotheses tests differ in the results they produce and what information is required, but they all share some basic terms and concepts.

By the end of this course, you will be able to

- Define and distinguish between statistical significance and practical significance
- Apply tests for significance level, power, and type I and type II errors
- Define null and alternative hypotheses
- List acceptable null and alternative hypotheses for statistical parameters
- Determine appropriate sample size for various tests
- Define confidence levels and confidence intervals
- Calculate confidence intervals for population parameters

Estimated completion time (hours): 1.5

Six Sigma Analyze

QUA-3017 Hypotheses Tests

Course Description

Six Sigma teams must understand the difference between the types of hypotheses tests to determine the proper test for the problem. Selection of the proper test is determined by the statistical parameter to be tested and the available information from the sample data.

By the end of this course, you will be able to

- List common hypotheses tests
- Define and describe paired-comparison hypotheses tests
- Define terms related to one-way ANOVAs and interpret their results and data plots
- Define and interpret chi-square and use it to determine statistical significance

Estimated completion time (hours): 2.7

Six Sigma Improve and Control

QUA-3018 Design of Experiments

Course Description

Properly designed experiments are essential to improving a Six Sigma project and making the project successful.

By the end of this course, you will be able to

- Define terms associated with the design of experiments
- Interpret main effects of a factor
- Interpret interaction plots

Estimated completion time (hours): 1.3

Six Sigma Improve and Control

QUA-3019 SPC

Course Description

Statistical Process Control, or SPC, is a quality control methodology that uses statistics to predict variation in processes. SPC is the basis for the control portion of a Six Sigma project.

By the end of this course, you will be able to

- Define statistical process control
- Define and describe the objectives and benefits of statistical process control
- Explain the types of variation that exist in a process
- Define and describe how rational subgrouping is used
- Identify, select, construct, and apply various control charts
- Interpret various control charts

Estimated completion time (hours): 1.7

Six Sigma Improve and Control

QUA-3020 Implement and Validate

Course Description

Improvements to a process are almost always needed to meet the goals of an organization. Many Six Sigma tools can be used to implement and validate the improvements.

By the end of this course, you will be able to

- List the steps to improve a process
- Identify Six Sigma tools used to improve a project
- Identify Six Sigma tools used to validate improvement efforts

Estimated completion time (hours): 0.8

Six Sigma Improve and Control

QUA-3021 Control Plans

Course Description

The control plan is one of the most important documents used to maintain the gains made during the analysis and improve portions of a Six Sigma project. The control plan is a “living” document that is continually updated to capture continuing improvements.

By the end of this course, you will be able to

- Define the minimum requirements for a control plan
- List sources of information for a control plan
- List required documents based on a control plan
- Define a dynamic control plan

Estimated completion time (hours): 1.0

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SIX SIGMA SKILLS COURSES

Six Sigma and the Organization

SIX-3001 Six Sigma and the Organization

Course Description

Six Sigma is the structured, disciplined pursuit of near perfection in the products or services an organization produces.

It is based on statistical techniques and tools, and attempts to improve an organization's bottom line by eliminating the variation in business processes that can result in defects.

By the end of this course, you will be able to

- Define the origins of Six Sigma
- Recognize why organizations use Six Sigma
- Explain how they apply its philosophy and goals
- Describe how process inputs, outputs, and feedback impact the larger organization
- Recognize key drivers for business and how key metrics and scorecards are developed
- Describe the project selection process
- Explain when to use Six Sigma improvement methodology as opposed to other problem-solving tools
- Explain how a project supports and is linked to organizational goals

Estimated completion time (hours): 1.9

Six Sigma and the Organization

SIX-3002 Lean Principles

Course Description

Lean principles are designed to help an organization achieve process perfection. The foundation of lean principles are employee involvement, adding the maximum value, and the elimination of waste. Lean is a journey toward understanding the customer and their needs.

By the end of this course, you will be able to

- Define and describe the concepts of lean, including pull and perfection
- Define and describe the elimination of waste using tools like 5S, kaizen, and poke-yoke
- Use a value stream map to identify waste
- Explain value
- Define value, value-added, and non-value-added
- Identify the terms used to describe waste
- Describe the theory of constraints

Estimated completion time (hours): 1.5

Six Sigma and the Organization

SIX-3003 Design for Six-Sigma

Course Description

Design for Six Sigma (DFSS) is an application of Six Sigma that encompasses the product design and redesign processes. DFSS makes certain that the voice of the customer is built into every new product and service.

By the end of this course, you will be able to

- Describe how quality function deployment fits into the overall DFSS process
- Define the purpose of the QFD
- Create a QFD matrix
- Explain the purpose of process and design failure mode and effects analyses (PFMEA and DFMEA)
- Calculate the RPN value for a PFMEA and DFMEA
- Explain the differences between a PFMEA and a DFMEA

Estimated completion time (hours): 1.0

Six Sigma Define

SIX-3004 Process Elements for Projects

Course Description

A Six Sigma project often requires a large amount of time from many people, and can be quite costly to the organization. The define portion of the DMAIC continuous improvement model provides the information and tools necessary to identify the issue causing decreased customer satisfaction, and to ensure the project will be a value-added activity.

By the end of this course, you will be able to

- Define components of processes
- Define process boundaries
- Describe the difference between internal and external customers
- Define process owner
- Define process stakeholder
- List some means of identifying customers
- Identify means for collecting customer data

Estimated completion time (hours): 1.2

Six Sigma Define

SIX-3005 Project Management Basics

Course Description

Basic project management techniques are key contributors to the success of a Six Sigma project. Creating a project charter and performing risk analysis during the define phase helps a Six Sigma project stay on target and addresses potential risks.

By the end of this course, you will be able to

- List the contents of a project charter
- Define problem statement
- Define purpose
- Define benefits
- Define scope
- Define results
- State the benefit of project risk analysis

Estimated completion time (hours): 1.1

Six Sigma Define

SIX-3006 Management and Planning Tools

Course Description

The success of a Six Sigma project depends on accurately identifying the current state of a process, and then assessing the problems within the process. A number of management and planning tools are available for this purpose.

By the end of this course, you will be able to

- Define affinity diagram
- Define interrelationship diagram
- Define tree diagram
- Define prioritization matrix
- Define PDPC
- Define activity network diagram
- Define matrix diagram
- Identify types and uses of matrix diagrams

Estimated completion time (hours): 0.7

Six Sigma Define

SIX-3007 Business Results for Improvement Projects

Course Description

To complete the define phase of a Six Sigma project, it's necessary to be able to assess its performance. Business results are measurements of performance that can be applied to the business, project, or process.

By the end of this course, you will be able to

- Define Defects per Unit (DPU)
- Define Rolled Throughput Yield (RTY)
- Define Defects per Million Opportunities (DPMO)
- Describe sigma level
- Describe process capability indices

Estimated completion time (hours): 1.1

Six Sigma Define

SIX-3008 Project Team Dynamics and Performance

Course Description

To be successful, a Six Sigma project must be executed by an effective team. Teams evolve over time, passing through definite phases of evolution until they find their place in the organization's Six Sigma structure.

By the end of this course, you will be able to

- Define and describe the stages of team evolution
- List the different roles in a Six Sigma team
- Define brainstorming
- Define nominal group technique
- Define multivoting

Estimated completion time (hours): 1.3

Six Sigma Define

SIX-3009 Problem Solving Tools

Course Description

A wide variety of tools exist for use in the define phase of a Six Sigma project. Each tool can provide insight into an organization's processes and help with the development of a good project plan.

By the end of this course, you will be able to describe the following common define phase tools:

- Surveys
- Focus groups
- Interviews
- Audits
- Cause and effect diagrams
- Check sheets
- Graphical charts
- Sampling plans
- Advanced Quality Planning (AQP)
- Benchmarking
- Force field analysis
- Gantt charts
- Project Evaluation and Review Technique (PERT)/Critical Path Method (CPM)

Estimated completion time (hours): 1.9

Six Sigma Measure

SIX-3010 Process Analysis and Documentation

Course Description

The measure portion of the DMAIC methodology provides a Six Sigma team with the tools needed to focus the project on possible causes of problems and solutions to those causes.

By the end of this course, you will be able to

- Identify and review process maps, written procedures, and work instructions
- Identify process input variables and process output variables
- Recognize the relationships between input variables and output variables

Estimated completion time (hours): 1.0

Six Sigma Measure

SIX-3011 Probability and Statistics

Course Description

In today's business world, companies cannot remain competitive if they must measure every product's weight, color, size, strength, and any other characteristic 100 percent. Organizations use probability and statistics to measure samples of a product and provide mathematical proof of the quality of the product or process.

By the end of this course, you will be able to

- Define probability
- Describe and apply probability concepts
- Define statistics
- List statistical parameters
- Distinguish between descriptive and inferential statistics
- Distinguish between a population parameter and a sample statistic
- Define a central limit theorem and its significance in statistics

Estimated completion time (hours): 2.1

Six Sigma Measure

SIX-3012 Collecting and Summarizing Data

Course Description

To improve a process or product it is important to know its current status and its status after improvements are made. Valid data must be collected and summarized to verify the status of the process or product.

By the end of this course, you will be able to

- Identify continuous or variable data
- Identify discrete or attribute data
- Describe and define nominal, ordinal, interval, and ratio measurement scales
- Define and apply methods for collecting data
- Define and apply techniques such as random sampling, stratified sampling, and sample homogeneity
- Depict relationships by constructing, applying, and interpreting diagrams and charts

Estimated completion time (hours): 1.7

Six Sigma Measure

SIX-3013 Probability Distributions

Course Description

A random experiment or sample can result in different outcomes. The probability that each outcome will occur can be calculated and charted using different probability distributions.

By the end of this course, you will be able to

- Describe and interpret normal, binomial, Poisson, t, chi square, and F distributions
- Identify formulas for calculating the probability of data values of different probability distributions

Estimated completion time (hours): 2.2

Six Sigma Measure

SIX-3014 Measurement System Analysis

Course Description

Data often consists of measurements of characteristics or conditions. A measurement system analysis is necessary to identify measurement variation and distinguish between measurement and process variation.

By the end of this course, you will be able to

- Define measurement system analysis
- Identify and conduct gauge repeatability and reproducibility studies
- Define measurement terms including sensitivity, accuracy, precision, bias, and linearity

Estimated completion time (hours): 2.5

Six Sigma Measure

SIX-3015 Process Capability Performance

Course Description

A main goal of a Six Sigma project is to reduce variation in a process. To meet this goal, the Six Sigma team must know the capability and performance of the process before and after improvements are implemented.

By the end of this course, you will be able to

- Describe the process of conducting a process capability study
- Distinguish between natural process limits and specification limits
- Define and calculate process capability indices
- Define and calculate process performance indices
- Describe the differences between short-term and long-term capability

Estimated completion time (hours): 1.9

Six Sigma Analyze

SIX-3016 Exploratory Data Analysis

Course Description

Before any problem can be eliminated or controlled, the cause of the problem must be identified and confirmed. Six Sigma teams use statistical tools to perform an analysis of data to identify and confirm the variable that causes most variation in a process or product.

By the end of this course, you will be able to

- Create and interpret multi-vari studies
- Identify the differences between positional, cyclical, and temporal variations
- Identify the largest source of variation in a process using a multi-vari study
- Interpret the linear correlation coefficient
- Determine the statistical significance of a linear correlation coefficient
- Identify the equation for linear regression

Estimated completion time (hours): 1.9

Six Sigma Analyze

SIX-3017 Hypotheses Test Basics

Course Description

Hypotheses tests are statistical methods of making decisions on the results of a study to determine if the results are truly related, or if they occur by chance. Hypotheses tests differ in the results they produce and what information is required, but they all share some basic terms and concepts.

By the end of this course, you will be able to

- Define and distinguish between statistical significance and practical significance
- Apply tests for significance level, power, and type I and type II errors
- Define null and alternative hypotheses
- List acceptable null and alternative hypotheses for statistical parameters
- Determine appropriate sample size for various tests
- Define confidence levels and confidence intervals
- Calculate confidence intervals for population parameters

Estimated completion time (hours): 1.5

Six Sigma Analyze

SIX-3018 Hypotheses Tests

Course Description

Six Sigma teams must understand the difference between the types of hypotheses tests to determine the proper test for the problem. Selection of the proper test is determined by the statistical parameter to be tested and the available information from the sample data.

By the end of this course, you will be able to

- List common hypotheses tests
- Define and describe paired-comparison hypotheses tests
- Define terms related to one-way ANOVAs and interpret their results and data plots
- Define and interpret chi-square and use it to determine statistical significance

Estimated completion time (hours): 2.7

Six Sigma Improve and Control

SIX-3019 Design of Experiments

Course Description

Properly designed experiments are essential to improving a Six Sigma project and making the project successful.

By the end of this course, you will be able to

- Define terms associated with the design of experiments
- Interpret main effects of a factor
- Interpret interaction plots

Estimated completion time (hours): 1.3

Six Sigma Improve and Control

SIX-3020 SPC

Course Description

Statistical Process Control, or SPC, is a quality control methodology that uses statistics to predict variation in processes. SPC is the basis for the control portion of a Six Sigma project.

By the end of this course, you will be able to

- Define statistical process control
- Define and describe the objectives and benefits of statistical process control
- Explain the types of variation that exist in a process
- Define and describe how rational subgrouping is used
- Identify, select, construct, and apply various control charts
- Interpret various control charts

Estimated completion time (hours): 1.7

Six Sigma Improve and Control

SIX-3021 Implement and Validate

Course Description

Improvements to a process are almost always needed to meet the goals of an organization. Many Six Sigma tools can be used to implement and validate the improvements.

By the end of this course, you will be able to

- List the steps to improve a process
- Identify Six Sigma tools used to improve a project
- Identify Six Sigma tools used to validate improvement efforts

Estimated completion time (hours): 0.8

Six Sigma Improve and Control

SIX-3022 Control Plans

Course Description

The control plan is one of the most important documents used to maintain the gains made during the analysis and improve portions of a Six Sigma project. The control plan is a “living” document that is continually updated to capture continuing improvements.

By the end of this course, you will be able to

- Define the minimum requirements for a control plan
- List sources of information for a control plan
- List required documents based on a control plan
- Define a dynamic control plan

Estimated completion time (hours): 1.0

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TECHNICAL SKILLS

**AEROSPACE
MANUFACTURING SKILLS
COURSES**

Aircraft Familiarization

AER-1001 The History of Aviation

Course Description

For millions of years, man has looked to the skies and longed to conquer the mystery of flight. Controlled flight has only become a reality throughout the past one hundred years. In this course, you will learn the amazing story of aviation and its most significant pioneers and milestones.

By the end of this course, you will be able to

- Identify the key milestones in aviation history

Estimated completion time (hours): 1.3

Aircraft Familiarization

AER-1002 Primary Assemblies of an Aircraft

Course Description

The airplane is a complex group of systems that work together to overcome the forces of nature and enable heavier-than-air flight. In this course, you will discover the major assemblies and their importance to the airplane.

By the end of this course, you will be able to

- Identify the primary assemblies of an airplane
- Identify the components of each of the primary assemblies
- Explain how the primary assemblies work together

Estimated completion time (hours): 1.2

Aircraft Familiarization

AER-1003 Principles of Flight

Course Description

The principles of flight are based upon the fundamental laws of physics and nature. In this course, you will learn how these laws work with the design of an aircraft to enable flight.

By the end of this course, you will be able to

- Identify the four forces that act upon an aircraft
- Explain the impact of atmospheric pressure on an airplane
- Explain the principles of lift
- Explain the function of an airfoil

Estimated completion time (hours): 1.7

Aircraft Familiarization

AER-1004 Airplane Control

Course Description

Airplane Control

Controlling an airplane takes more than mechanical control systems. It also requires design characteristics that ensure the airplane will be maneuverable and stable in flight. In this course, you will learn how the mechanical systems and the design of an airplane impact its flight characteristics.

By the end of this course, you will be able to

- Identify the three axes of control
- Explain the center of gravity of an airplane
- Identify the control systems of an airplane
- Identify the nine type of stability

Estimated completion time (hours): 1.5

Aircraft Familiarization

AER-1005 Aircraft Configuration

Course Description

Aircraft are manufactured in many shapes, sizes, and configurations. In this course, you will learn how to identify airplanes based on their unique configuration.

By the end of this course, you will be able to

- Identify airplanes based on their commercial purpose
- Identify airplanes based on their wing location
- Identify airplanes based on their tail configuration
- Identify airplanes based on their engine type and location
- Explain the advantages of each configuration

Estimated completion time (hours): 2.0

Aircraft Familiarization

AER-1006 Aircraft Materials

Course Description

The materials used in aircraft construction are carefully selected based upon their strength, weight, and physical properties. Choosing the correct materials ensures that an aircraft will safely perform as designed. In this course, you will learn the different types of materials that are used in aircraft construction.

By the end of this course, you will be able to

- Identify the types of materials used in aircraft construction
- Identify the properties of each material
- Understand the process of selecting the proper materials
- Explain the strengths and weaknesses of each type of material

Estimated completion time (hours): 1.8

Aircraft Familiarization

AER-1007 Aircraft Construction

Course Description

Airplanes are constructed in a variety of ways. Each unique method is a tribute to the skills of airplane designers, engineers, and production teams. In this course, you will learn the methods that are used to construct airplanes.

By the end of this course, you will be able to

- Identify the major types of aircraft construction
- Identify the components of an airframe
- Identify the construction methods used in aircraft manufacturing

Estimated completion time (hours): 2.5

Aircraft Familiarization

AER-1008 Aircraft Corrosion

Course Description

Corrosion is a natural phenomenon which attacks metals and converts them into metallic compounds like oxides, hydroxides, or sulfates. In this course, you will learn about corrosion and the impact it can have on aircraft components.

By the end of this course, you will be able to

- Define corrosion
- Explain the corrosion process
- Identify the conditions that must exist for corrosion to occur
- Recognize different types of corrosion
- Identify common corrosive agents
- Identify metals that are subject to corrosion
- Identify preventative measures for corrosion

Estimated completion time (hours): 1.7

Aircraft Familiarization

AER-1009 Aircraft Regulations

Course Description

In the aviation industry, regulations control airplane design, airline flights, and govern everyone involved in flying. Regulations promote safe aviation and are serious matters that can never be ignored. In this course, you will learn the purpose and importance of regulations in the aviation industry.

By the end of this course, you will be able to

- Define the purpose of regulations
- Identify why aviation is regulated
- Recognize different regulatory bodies and their roles in aviation
- Identify the culture and behavior of regulation
- Define the purpose of inspection in the aviation industry
- Identify customer expectations

Estimated completion time (hours): 0.9

Aerospace Sealing and Safety

AER-2001 Introduction to Sealing

Course Description

Sealing the surfaces of an airplane is vital to maintaining the aerodynamics of the airplane, preventing cabin pressure loss, inhibiting corrosion, and providing leak-proof fuel tanks.

By the end of this course, you will be able to

- Understand the purpose of sealing
- Describe how sealing prevents corrosion
- List the other important functions of sealants

Estimated completion time (hours): 0.8

Aerospace Sealing and Safety

AER-2002 Chemical Safety

Course Description

The solvents and sealants used in the construction of an airplane are chemicals. Understanding how to properly protect yourself from unnecessary chemical exposure will ensure you remain safe and healthy.

By the end of this course, you will be able to

- Define a physical hazard in relation to working with chemicals
- Define a health hazard in relation to working with chemicals
- List some potential physical hazards associated with chemicals
- List some health hazards associated with chemicals
- Understand what is meant by exposure to a chemical
- Understand some of the personal protective equipment used to minimize your exposure to chemicals

Estimated completion time (hours): 1.0

Aerospace Sealing and Safety

AER-2003 Preparing the Surface

Course Description

Before sealant is applied to the surfaces of an airplane, those surfaces must be clean of debris, oil, and other contamination. Proper cleaning requires training in specialized cleaning techniques.

By the end of this course, you will be able to

- List the steps in the cleaning process
- Recognize the tools used for cleaning surfaces in the airplane
- Know some common solvents used for cleaning surfaces in the airplane
- Describe the steps necessary to correctly apply solvents to a surface that must be cleaned
- Recognize when a surface is properly cleaned and ready for sealing

Estimated completion time (hours): 1.0

Aerospace Sealing and Safety

AER-2004 Selecting the Right Sealant

Course Description

The type of sealant you will use depends on the function and purpose of the component you are sealing. Knowing how to select the correct sealant is essential to performing the proper sealing process.

By the end of this course, you will be able to

- List the common categories of sealants
- Know the difference between premixed and two part sealants
- Know why some premixed sealants must be stored in the freezer
- List the different sealant applications
- Understand the function of the different sealant applications
- Know where to look for the information you'll need to ensure you use the right sealant for the right application

Estimated completion time (hours): 0.9

Aerospace Sealing and Safety

AER-2005 Applying the Sealant

Course Description

A special tool called a sealing gun is used to apply sealant to the different parts of an airplane. Understanding how to properly use the sealing gun will ensure you perform the sealing process properly.

By the end of this course, you will be able to

- Identify the parts of the sealing gun
- Assemble a sealing gun
- Describe proper sealant application guidelines

Estimated completion time (hours): 0.9

Aerospace Electrical Bond and Ground

AER-2006 Electricity and the Airplane

Course Description

Electricity is used in almost every system on an airplane. The flow of electricity must be managed properly through the airplane structure.

By the end of this course, you will be able to

- Explain electrical resistance
- Calculate electrical resistance
- Explain why low resistance metals are important in airplane construction
- List the electrical hazards that occur if electricity is not controlled
- Explain Ohm's law
- Explain how Ohm's law can be used to calculate resistance

Estimated completion time (hours): 1.4

Aerospace Wire Bundle Basics

AER-2007 Wiring in Airplanes

Course Description

Wiring provides a pathway to power and control of almost every function in modern commercial airplanes. Knowledge of wire usage in an airplane is a valuable tool for airplane technicians.

By the end of this course, you will be able to

- List the uses of wires in airplanes
- List the components of wires
- Understand the differences between material classes of wire
- Define the material grades of wire

Estimated completion time (hours): 0.8

Aerospace Wire Bundle Basics

AER-2008 Wire and Cable Basics

Course Description

Understanding the correct terms for wire components and collections of wires is very important for effective communications between aircraft technicians and engineering and quality personnel.

By the end of this course, you will be able to

- Recognize different types of cables
- Understand the materials used in wires and cables
- Understand the advantages of stranded wire over solid wire in airplanes
- Recognize the importance of the plating on conductors
- Understand the AWG wire sizes
- Define CAU and perform CAU calculations

Estimated completion time (hours): 1.5

Aerospace Wire Bundle Basics

AER-2009 Wire, Cable, and Wire Bundle Markings

Course Description

Understanding the basic identifiers of wires, cables, and wire bundles provides an excellent foundation for developing the skills to create and install wire bundles.

By the end of this course, you will be able to

- Understand wire bundle, wire, and cable identifiers
- Define the differences among colored flag markers
- Understand markings for connectors
- Understand how to determine when a splice is to be installed
- Describe the uses of pink, green, and purple flag markers

Estimated completion time (hours): 1.0

Aerospace Wire Bundle Basics

AER-2010 Circular Connectors and Contacts

Course Description

Assembly electricians are often required to attach connectors during wire bundle installations. Knowledge of the tools and materials used to do this is very important.

By the end of this course, you will be able to

- List the parts of a connector
- Understand the purpose of a backshell
- List the tools needed to strip insulation
- List the parts of a wire stripper
- Understand the difference between pin and socket contacts
- List the parts of a contact crimping tool
- Define clocking

Estimated completion time (hours): 1.5

Aerospace Wire Bundle Basics

AER-2011 Installing a Connector

Course Description

Understanding the parts of circular connectors and how they mate with each other enables an assembly electrician to install these connectors correctly.

By the end of this course, you will be able to

- Strip different size wires
- Crimp contacts onto wires
- Insert the contacts into a connector
- Clock a connector and backshell

Estimated completion time (hours): 1.7

Aerospace Wire Bundle Basics

AER-2012 MTC Connectors

Course Description

Understanding the parts of MTC connectors and how they mate with each other enables an assembly electrician to install these connectors correctly.

By the end of this course, you will be able to

- Describe an MTC connector
- Understand the process of keying MTC connectors
- List the parts of an MTC connector
- List the advantage of an MTC connector over a circular connector

Estimated completion time (hours): 0.9

Aerospace Wire Bundle Basics

AER-2013 Tying Wire Bundles

Course Description

Understanding the different methods, materials, and tools to tie wire bundles is important information for assembly electricians.

By the end of this course, you will be able to

- Understand the areas of an airplane where cable ties are permitted
- Understand the process of tying wire bundles with lacing material
- Understand the process of tying wire bundles with cable ties
- Tie four different knots with lacing tape
- List the parts of a cable tie gun

Estimated completion time (hours): 1.5

Aircraft Systems

AER-3001 Flight Control Systems

Course Description

The flight control systems of an airplane function to manipulate the flight control surfaces of the airplane. In this course, you will learn the purpose and function of airplane flight control system components.

By the end of this course, you will be able to

- Identify the primary flight control systems in an airplane
- Identify the secondary flight control systems in an airplane
- Identify the components of a mechanical flight control linkage system in an airplane
- Explain why mechanical systems are supplemented by hydraulic and pneumatic systems in larger airplanes
- Explain the purpose and function of a fly-by-wire or electronic flight control system

Estimated completion time (hours): 1.2

Aircraft Systems

AER-3002 Mechanical Systems

Course Description

The mechanical systems in the airplane function to operate the primary flight control surfaces and other systems of the plane, including landing gear. In this course, you will learn about the different mechanical linkage systems in an airplane and the systems they operate.

By the end of this course, you will be able to

- Identify the components of a cable and pulley mechanical linkage system
- Identify the components of a push-pull control rod mechanical linkage system

Estimated completion time (hours): 1.1

Aircraft Systems

AER-3003 Landing Gear Systems

Course Description

The landing gear on an airplane serves two purposes. It allows the plane to take off and land safely, and it allows the pilot to maneuver the plane on the ground. In this course, you will learn the parts of an airplane's landing gear and how the landing gear operates to land an airplane and to maneuver the airplane on the ground.

By the end of this course, you will be able to

- Identify the different types of landing gear
- Identify the parts of a landing gear system
- Understand how landing gear absorbs the shock of landing an airplane
- Understand how brake systems operate as part of the landing gear
- Understand how landing gear works to move the airplane after it has landed

Estimated completion time (hours): 1.7

Aircraft Systems

AER-3004 Aerospace Hydraulic Systems

Course Description

Hydraulic systems are fluid power systems used in airplanes. A fluid power system is a mechanical system that uses the energy created by moving fluid to do work. Fluid power makes many systems in an airplane work, including the landing gear and flight control systems.

By the end of this course, you will be able to

- Describe a fluid power system
- Identify which systems on an airplane are operated hydraulically
- List the components of a typical hydraulic system
- Describe the functions of the different parts of a hydraulic system
- Understand how a simple hydraulic circuit works
- Know the advantages and disadvantages of hydraulic systems
- Know some of the dangers associated with hydraulic system maintenance

Estimated completion time (hours): 1.4

Aircraft Systems

AER-3005 Aerospace Pneumatic Systems

Course Description

A pneumatic system is a mechanical system that uses energy created by pressurized air to do work. Pneumatic systems operate many critical systems on an airplane and provide backup support when hydraulic systems fail.

By the end of this course, you will be able to

- Describe a pneumatic system
- List the components of a typical pneumatic system
- Describe the functions of the different parts of a pneumatic system
- Understand how a simple pneumatic system works
- Know the advantages and disadvantages of pneumatic systems
- Know some of the dangers associated with pneumatic system maintenance

Estimated completion time (hours): 1.2

Aircraft Systems

AER-3006 Electrical Systems

Course Description

Electricity powers many different systems in an airplane. In this course, you will learn about the components of an electrical system, how an electrical system works, and how to safely handle electrical components.

By the end of this course, you will be able to

- Identify the key components of an electrical system
- Explain how an electrical system works
- Explain safety precautions when interacting with electrical systems
- Explain electrostatic discharge and how to prevent it

Estimated completion time (hours): 1.2

Aircraft Systems

AER-3007 Propulsion Systems

Course Description

Propulsion systems help the airplane overcome drag and achieve lift. They are a critical component to safely sustaining flight. In this course, you will learn the two primary types of propulsion systems and how they operate.

By the end of this course, you will be able to

- Describe the type of propulsion systems used in airplanes
- List the types of reciprocating engines
- List the major components of a reciprocating engine
- Describe how a reciprocating engine works
- List the major components of a turbine engine
- Describe how a turbine engine works
- Understand the importance of preventing foreign object damage

Estimated completion time (hours): 1.7

Aircraft Systems

AER-3008 Fuel Systems

Course Description

Fuel system store and deliver fuel to the aircraft power plants. In this course, you will learn about the types of fuel systems and how they function.

By the end of this course, you will be able to

- Identify the basic fuel storage tanks
- Identify the components of the fuel system
- Explain how the fuel system works

Estimated completion time (hours): 1.0

Aircraft Systems

AER-3009 Avionics Systems

Course Description

The term avionics includes all the electronic equipment on an airplane. This equipment includes hundreds of systems, such as navigation, communication, sensors and indicators, and onboard computers. Most of the avionic equipment is located in the airplane's cockpit.

By the end of this course, you will be able to

- Identify airplane instruments located on the instrument panel
- Identify airplane instrument safety markings
- Understand important safety considerations when installing avionic equipment

Estimated completion time (hours): 1.5

Aircraft Systems

AER-3010 Anti-Icing and De-Icing Systems

Course Description

Airplanes are exposed to all kinds of weather patterns that can create icy conditions. In this course, you will learn about the various systems that protect and remove ice from an airplane.

By the end of this course, you will be able to

- Explain how ice forms on an airplane
- Identify anti-icing systems that prevent ice from forming on an airplane
- Identify de-icing systems that remove ice that has formed on an airplane
- Explain important safety considerations when applying de-icing chemicals

Estimated completion time (hours): 1.3

Aircraft Systems

AER-3011 Environmental Systems

Course Description

Environmental systems maintain the oxygen supply, temperature, and safety of the airplane cabin's environment. In this course, you will learn why these systems are needed and how they operate.

By the end of this course, you will be able to

- Explain atmospheric pressure and how it affects breathing
- Know the history of cabin pressurization
- List the components of a cabin pressurization system
- List the cabin pressurization valves
- Know the cabin's thermal control systems
- Explain how altitude affects cabin's temperature
- Identify the locations of safety systems

Estimated completion time (hours): 1.5

Aircraft Systems

AER-3012 Window and Door Systems

Course Description

Windows and doors are an integral part of the airplane structure. They allow safe entry and exit and give passengers a wonderful view from above. Their construction and function is critical to the safety of the airplane and its passengers. In this course, you will learn the purpose and function of the windows and doors of an airplane.

By the end of this course, you will be able to

- Define the function of windows in an airplane
- List all of the types of doors
- Describe the function of each type of door
- Explain how the windows and doors are a part of the airframe

Estimated completion time (hours): 1.2

Aircraft Systems

AER-3013 Commercial Aircraft Structures

Course Description

There are several engineered structural components inside the airframe of a commercial aircraft. Each of these components serves a unique function in terms of increasing the overall strength of the airframe.

By the end of this course, you will be able to

- Identify the major components of an aircraft structure
- Explain the purpose of semi-monocoque construction
- List other structural components used to increase aircraft structure rigidity

Estimated completion time (hours): 1.0

Basic Drilling and Riveting

AER-4001 Marking Fastener Locations for Drilling Project

Course Description

Before holes are drilled in an assembly, their locations must be marked.

By the end of this course, you will be able to

- Recognize fastener location and identification information on an engineering drawing
- Explain where to find the tools, fasteners, and other supplies needed to create an assembly
- Prepare the surface of an assembly for mark up
- Properly measure and mark corner fastener locations
- Calculate fastener locations using information given on the engineering drawing
- Mark fastener locations using the calculated fastener location information

Estimated completion time (hours): 0.9

Basic Drilling and Riveting

AER-4002 Setting Up the Drill Motor

Course Description

Drilling a quality hole starts with properly aligning the pieces in the assembly and correctly installing a drill bit in the drill motor.

By the end of this course, you will be able to

- Prepare the assembly and drill motor
- Properly stack and align the pieces used in this assembly
- Install a pilot bit in a drill motor

Estimated completion time (hours): 0.7

Basic Drilling and Riveting

AER-4003 Drilling Pilot Holes and Enlarging Holes

Course Description

Pilot holes are typically the first holes drilled in any assembly. They are usually too small to accommodate the shank of any standard fastener, so they must be enlarged before fasteners can be installed in the assembly.

By the end of this course, you will be able to

- Create a drill start with a drill motor and pilot bit
- Drill a pilot hole
- Exchange a pilot bit for a larger drill bit
- Set a drill stop
- Enlarge a hole to size
- Inspect a full size hole using a Go/NoGo pin gauge

Estimated completion time (hours): 1.1

Basic Drilling and Riveting

AER-4004 Deburring

Course Description

Burrs are raised material left around the edge of a drilled hole. This excess material must be removed, or it may interfere with fastener installation. The process of removing this material is called deburring.

By the end of this course, you will be able to

- Use an open countersink to deburr holes
- Use a flat file to deburr holes

Estimated completion time (hours): 0.9

Basic Drilling and Riveting

AER-4005 Driving Protruding Head Rivets

Course Description

This course is a simulated student project that teaches how to install and inspect protruding head rivets in an aircraft assembly or structure.

By the end of this course, you will be able to

- Install a cup die into a rivet gun
- Use a rivet gun and bucking bar to install protruding head rivets
- Visually inspect the manufactured heads of rivets
- Inspect the manufactured heads of driven rivets using a gap inspection shim
- Inspect the driven heads of rivets using a spoon gauge
- Inspect the driven heads of rivets using an H-gauge

Estimated completion time (hours): 1.1

Installing Advanced Fasteners Project

AER-4006 Assembly Preparation for Advanced Fasteners Project

Course Description

Before fasteners can be installed in this assembly, it must be constructed and holes prepared.

By the end of this course, you will be able to

- Recognize fastener location and identification information on an engineering drawing
- Mark fastener locations on the assembly
- Drill pilot holes in an assembly
- Enlarge holes to size
- Take the assembly apart
- Deburr holes in the assembly

Estimated completion time (hours): 1.1

Installing Advanced Fasteners Project

AER-4007 Installing Nut Plates

Course Description

A Winslow drill motor is used to create the additional holes needed to fasten nut plates to the assembly.

By the end of this course, you will be able to

- Choose appropriate material for a scrap assembly
- Operate a Winslow drill
- Adjust a Winslow drill
- Install nut plates

Estimated completion time (hours): 1.0

Installing Advanced Fasteners Project

AER-4008 Compression Riveting

Course Description

Installing rivets with a compression riveter is faster and more consistent than installing rivets with a pneumatic rivet gun.

By the end of this course, you will be able to

- Use a compression riveter to install rivets in the assembly

Estimated completion time (hours): 0.8

Installing Advanced Fasteners Project

AER-4009 Installing Bolts

Course Description

Bolts are installed using either manual or pneumatic torque tools.

By the end of this course, you will be able to

- Install bolts with a pneumatic torque tool

Estimated completion time (hours): 0.7

Installing Advanced Fasteners Project

AER-4010 Securing Bolts with Lockwire

Course Description

Lockwire is used to secure bolts and prevent them from loosening. Lockwire can be installed by hand with regular pliers or with lockwire pliers.

By the end of this course, you will be able to

- Install lockwire using lockwire pliers

Estimated completion time (hours): 0.8

Countersinking and Flush Riveting Project

AER-4011 Marking Fastener Locations for Countersinking and Flush Riveting Project

Course Description

Before holes are drilled in an assembly, their locations must be identified and marked.

By the end of this course, you will be able to

- Recognize fastener identification information on an engineering drawing
- Determine fastener locations using information given on the engineering drawing
- Mark all fastener locations on the part

Estimated completion time (hours): 1.0

Countersinking and Flush Riveting Project

AER-4012 Setting Up the Assembly and Drill

Course Description

The first step when installing a flush head rivet is to select and install the proper drill bit in the drill motor.

By the end of this course, you will be able to

- Properly secure the assembly in the vise
- Install a pilot bit in a drill motor

Estimated completion time (hours): 0.7

Countersinking and Flush Riveting Project

AER-4013 Drilling, Enlarging, and Deburring Holes

Course Description

Prior to installing fasteners in any assembly, pilot holes must be drilled. Because pilot holes are not large enough to accommodate fasteners, the pilot holes must be enlarged to size. Any burrs that form during the drilling process must also be removed.

By the end of this course, you will be able to

- Drill a pilot hole
- Exchange a pilot bit for a larger drill bit
- Set a drill stop
- Enlarge a hole to size
- Inspect a full size hole with a Go/NoGo pin gauge
- Use an open countersink to deburr holes

Estimated completion time (hours): 1.4

Countersinking and Flush Riveting Project

AER-4014 Setting the Countersink Tool (project)

Course Description

Check and adjust the countersink depth by creating several practice countersinks in scrap material of the same composition and thickness as the assembly.

By the end of this course, you will be able to

- Choose an appropriate piece of scrap material
- Determine hole locations on a scrap part
- Countersink a hole
- Use a Federal gauge to inspect a countersink
- Install a flush head rivet
- Use a Federal gauge to inspect a flush head rivet
- Adjust the depth of a countersink cutter

Estimated completion time (hours): 1.4

Countersinking and Flush Riveting Project

AER-4015 Countersinking (project)

Course Description

Once you have verified the depth of the countersink cutter in the scrap assembly, you can countersink holes in the final assembly.

By the end of this course, you will be able to

- Countersink holes of various sizes
- Measure countersinks with a Federal gauge

Estimated completion time (hours): 0.8

Countersinking and Flush Riveting Project

AER-4016 Flush Riveting

Course Description

After the holes in the assembly are drilled and countersunk, the flush rivets are installed in the assembly.

By the end of this course, you will be able to

- Install flush head rivets
- Visually inspect the manufactured head of a flush head rivet
- Use a digital gauge to inspect the manufactured head of a flush head rivet
- Use a spoon gauge to inspect the clinch diameter of a flush head rivet
- Use a spoon gauge to inspect the clinch thickness of a flush head rivet

Estimated completion time (hours): 1.3

90 Degree Drilling Project

AER-4017 Assembly Preparation for 90 Degree Drilling Project

Course Description

Before the fasteners can be installed in this assembly, the assembly must be constructed and the holes prepared.

By the end of this course, you will be able to

- Recognize fastener location and identification information on an engineering drawing
- Explain where to find the tools, fasteners, and other supplies needed to create the assembly
- Mark fastener locations on the assembly
- Drill pilot holes in the assembly
- Enlarge the pilot holes to size
- Chamfer the holes in the assembly
- Take the assembly apart
- Deburr holes in the assembly

Estimated completion time (hours): 1.6

90 Degree Drilling Project

AER-4018 Installing 5/16 Inch Hi-Loks

Course Description

Hi-Loks are installed using a combination of tools. There are several different tools you can use to install the collar of a Hi-Lok, including manual torque tools and pneumatic torque tools.

By the end of this course, you will be able to

- Install a Hi-Lok
- Use a pneumatic torque tool to install a Hi-Lok collar
- Inspect the manufactured head of an installed Hi-Lok with a gap inspection shim
- Inspect the collar of an installed Hi-Lok using a pin protrusion gauge

Estimated completion time (hours): 0.9

90 Degree Drilling Project

AER-4019 Installing 3/16 Inch Hi-Loks

Course Description

Two different size Hi-Loks are required for this assembly: 5/16 inch and 3/16 inch.

By the end of this course, you will be able to

- Install a Hi-Lok
- Use a hand tool to install a Hi-Lok collar
- Inspect the manufactured head and collar of an installed Hi-Lok with a gap inspection shim
- Inspect the collar of an installed Hi-Lok using a pin protrusion gauge

Estimated completion time (hours): 0.9

90 Degree Drilling Project

AER-4020 Installing Protruding Head Rivets

Course Description

This assembly requires three vertical rows of protruding head rivets.

By the end of this course, you will be able to

- Use a rivet gun and bucking bar to install protruding head rivets
- Inspect the manufactured and driven heads of the rivets

Estimated completion time (hours): 0.8

90 Degree Drilling Project

AER-4021 Removing Rivets in the 90 Degree Drilling Project

Course Description

The tools and techniques used to remove rivets differ from those used to install rivets.

By the end of this course, you will be able to

- Mark the manufactured head of an installed rivet with a drill bit
- Use a drill motor and drill bit to remove the manufactured head of an installed rivet
- Use a pin punch and ball peen hammer to remove the shank of an installed rivet

Estimated completion time (hours): 0.8

90 Degree Drilling Project

AER-4022 Removing 5/16 Inch Hi-Loks

Course Description

A specially designed pair of pliers called Hi-Lok collar pliers can be used to remove Hi-Lok collars.

These pliers deform the shape of the collar, loosening it from the Hi-Lok shank.

By the end of this course, you will be able to

- Use a pair of Hi-Lok pliers to grip the collar of an installed Hi-Lok
- Use a pin punch and ball peen hammer to remove the shank of an installed Hi-Lok

Estimated completion time (hours): 0.7

Drilling Titanium

AER-4023 Drilling Titanium

Course Description

To drill a quality hole in titanium material, you need to understand titanium materials and have good basic drilling knowledge and skills.

By the end of this course, you will be able to

- List some qualities of titanium material
- Understand the hazards of working with titanium materials
- Define a quality hole
- Understand how to drill a quality hole in titanium material
- Recognize some common hole defects

Estimated completion time (hours): 2.1

Drilling Titanium

AER-4024 Marking Hole Locations for Drilling Titanium

Course Description

Before holes are drilled in an assembly, their locations must be marked.

By the end of this course, you will be able to

- Recognize hole location information on an engineering drawing
- Explain where to find the tools and other supplies needed to create an assembly
- Prepare the surface of an assembly for mark up
- Properly measure and mark hole locations in the assembly

Estimated completion time (hours): 1.0

Drilling Titanium

AER-4025 Drilling Pilot Holes in Titanium

Course Description

In this course, you will be shown how to create the assembly and drill pilot holes.

By the end of this course, you will be able to

- Create an assembly
- Properly secure the assembly in the vise
- Install a pilot bit in a drill motor
- Drill pilot holes into the assembly

Estimated completion time (hours): 0.9

Drilling Titanium

AER-4026 Drilling and Enlarging Holes in Row JD2

Course Description

After the pilot holes are drilled in rows JD1, and JD3 through JD8, drill the pilot holes in row JD2 and then enlarge them.

By the end of this course, you will be able to

- Use a ninety-degree drill motor to drill the pilot holes in row JD2
- Use a ninety-degree drill motor and two separate single step drill bits to enlarge the pilot holes to size

Estimated completion time (hours): 1.1

Drilling Titanium

AER-4027 Enlarging Row JD7

Course Description

The next row of holes to enlarge is row JD7.

By the end of this course, you will be able to

- Enlarge the holes in row JD7

Estimated completion time (hours): 0.8

Drilling Titanium

AER-4028 Enlarging Rows JD4, JD5, and JD6

Course Description

After enlarging the holes in row JD7, enlarge the holes in rows JD4, JD5, and JD6.

By the end of this course, you will be able to

- Enlarge the holes in rows JD4, JD5, and JD6

Estimated completion time (hours): 0.8

Drilling Titanium

AER-4029 Enlarging Rows JD1 and JD3

Course Description

After enlarging the holes in rows JD4, JD5, JD6, and JD7, enlarge row JD1 and JD3.

By the end of this course, you will be able to

- Use two reamers to enlarge the holes in rows JD1 and JD3 to size

Estimated completion time (hours): 1.0

Drilling Titanium

AER-4030 Enlarging Row JD8

Course Description

After enlarging the holes in all the other rows in the assembly, enlarge the holes in row JD8.

By the end of this course, you will be able to

- Enlarge the holes in row JD8

Estimated completion time (hours): 0.8

Drilling Titanium

AER-4031 Chamfering

Course Description

Two rows in the final assembly require chamfers: rows JD4 and JD6.

By the end of this course, you will be able to

- Choose appropriate scrap material
- Mark hole locations and drill and chamfer holes in scrap material
- Measure the diameter of a chamfer with a countersink gauge
- Adjust a countersink cutter to create a chamfer of the correct diameter
- Chamfer holes in the final assembly

Estimated completion time (hours): 1.0

Drilling Titanium

AER-4032 Edge Breaking and Deburring

Course Description

Although no fasteners will be installed in this assembly, it is still important that you learn the final hole finishing procedures required for titanium assemblies.

By the end of this course, you will be able to

- Edge break a hole to a specified diameter
- Inspect an edge break using a countersink gauge
- Deburr holes in a titanium assembly

Estimated completion time (hours): 1.4

Wing Structure Project

AER-4033 Tools for Wing Structure Project

Course Description

Understanding the types of materials you'll be working with when assembling the wing of an airplane is important. Wing structures are assembled using thicker materials and a variety of fasteners and fastener installation techniques.

By the end of this course, you will be able to

- Recognize a drilling template
- Understand the difference between a fixture, jig, and template
- Understand the function of a drilling template
- Recognize a fluid-tight fastener with a counterbored and countersunk head
- Describe a counterbore and countersink drill bit
- List the parts of a rivet shaver
- Know how a rivet shaver works

Estimated completion time (hours): 1.2

Wing Structure Project

AER-4034 Preparing the Assembly for the Wing Structure Project

Course Description

Before installing fasteners, the locations of the holes in the assembly must be marked and pilot holes drilled in many of these locations.

By the end of this course, you will be able to

- Recognize hole location information on an engineering drawing
- Locate the tools required to mark hole locations on the assembly
- Mark hole locations on the wing structure assembly
- Drill all the pilot holes common to the -2 parts in the assembly

Estimated completion time (hours): 1.4

Wing Structure Project

AER-4035 Countersinking and Fillet Relief

Course Description

Fillet relief and countersinking are required for some of the holes in this assembly. Other holes, require a combination of counterboring and countersinking to accommodate fluid-tight fasteners.

By the end of this course, you will be able to

- Countersink holes
- Counterbore and countersink holes for fluid-tight fasteners

Estimated completion time (hours): 1.2

Wing Structure Project

AER-4036 Installing Fasteners

Course Description

There are many types of fasteners installed on the wing structure including Hi-Loks, lockbolts, protruding head rivets and fluid-tight rivets.

By the end of this course, you will be able to

- Install Hi-Loks
- Install lockbolts
- Install protruding head rivets
- Install fluid-tight rivets
- Shave the heads of fluid-tight rivets

Estimated completion time (hours): 1.4

Fuselage Skin Assembly

AER-4037 Preparing the Assembly for the Fuselage Skin Assembly

Course Description

Preparation of the assembly includes gathering supplies, tools and setting up the project on the assembly jig.

By the end of this course, you will be able to

- Know where to find the supplies and tools you'll need to create this assembly
- Describe an assembly jig
- Understand the function of an assembly jig
- Set up the fuselage skin assembly project on the jig

Estimated completion time (hours): 1.1

Fuselage Skin Assembly

AER-4038 Drilling the Skin Panels

Course Description

Before you can install fasteners, you'll need to mark the locations of pilot holes, drill the pilot holes, and then enlarge them to full size.

By the end of this course, you will be able to

- Set up your drill motor to drill pilot holes
- Drill the holes in the skin panels
- Set up your drill motor to drill full size holes
- Enlarge the holes in the skin panels

Estimated completion time (hours): 1.1

Fuselage Skin Assembly

AER-4039 Preparing the Doubler

Course Description

Doublers are used to increase the strength of the fuselage assembly.

By the end of this course, you will be able to

- Drill pilot holes in the doubler
- Locate the doubler on the skin panel
- Enlarge the holes in the doubler to accommodate the fasteners

Estimated completion time (hours): 1.0

Fuselage Skin Assembly

AER-4040 Countersinking

Course Description

Countersinking is required before installing flush head rivets into the fuselage assembly.

By the end of this course, you will be able to

- Countersink holes in the fuselage skin assembly

Estimated completion time (hours): 0.8

Fuselage Skin Assembly

AER-4041 Assembly Finish and Fastener Installation

Course Description

The final assembly steps include drilling some additional holes and installing fasteners in the assembly.

By the end of this course, you will be able to

- Drill the final holes in the assembly
- Remove the assembly from the jig
- Take the assembly apart
- Deburr the holes in the assembly
- Clean the assembly
- Rebuild the assembly and return it to the assembly jig
- Install Hi-Loks in the assembly
- Install flush head rivets in the assembly

Estimated completion time (hours): 1.1

Fuselage Skin Assembly

AER-4042 Removing Rivets in the Fuselage Skin Assembly

Course Description

Tools and techniques different from those used to install rivets are used to remove them.

By the end of this course, you will be able to

- Mark the manufactured head of an installed rivet with a drill bit
- Use a drill motor and drill bit to remove the manufactured head of an installed rivet
- Use a pin punch and ball peen hammer to remove the shank of an installed rivet

Estimated completion time (hours): 0.8

Sealant Applicant Processes Mechanical Project

AER-4043 Sealing Basics

Course Description

There are many types of sealants used on an aircraft assembly. Surface preparation is critical to the success of a seal.

By the end of this course, you will be able to

- Define sealing and understand the purpose of sealing in airplane assembly
- Describe the types of sealants
- Understand general surface preparation when sealing
- Understand how to be safe during the sealing process
- Identify the curing phases in the sealing process

Estimated completion time (hours): 1.6

Sealant Applicant Processes Mechanical Project

AER-4044 Fay and Prepack Sealing

Course Description

Fay and prepack sealing is one of the methods for applying sealant.

By the end of this course, you will be able to

- Define fay sealing
- Identify where fay seals are used
- Understand the process of fay sealing
- Define prepack sealing
- Identify where prepack seals are used
- Understand the process of prepack sealing

Estimated completion time (hours): 1.6

Sealant Applicant Processes Mechanical Project

AER-4045 Fillet and Injection Sealing

Course Description

Fillet and injection sealing is one of the methods for applying sealant.

By the end of this course, you will be able to

- Define fillet sealing
- Identify where fillet seals are used
- Understand depth of fillet
- Understand the process of fillet sealing
- Define injection sealing
- Identify where injection seals are used
- Understand the process of injection sealing

Estimated completion time (hours): 1.4

Sealant Applicant Processes Mechanical Project

AER-4046 Cap Sealing

Course Description

Cap sealing is one of the methods for applying sealant.

By the end of this course, you will be able to

- Define cap sealing
- Identify where cap seals are used
- Understand the process of cap sealing

Estimated completion time (hours): 1.1

Aerospace Electrical Bond and Ground Project

AER-4047 Electrical Bond and Ground Introduction

Course Description

Ground studs enable the aircraft airframe to become used as a part of the overall electrical circuit. Installing grounds studs properly is critical to the overall safety and operation of the aircraft.

By the end of this course, you will be able to

- List the steps required to install a pre-installed ground stud
- List the steps required to install a direct standard ground stud
- Explain how to use the power tools to install ground studs

Estimated completion time (hours): 1.1

Aerospace Electrical Bond and Ground Project

AER-4048 Pre-installed Ground Studs

Course Description

Bonding and grounding ensures that all electrical energy within the airplane flows per engineering specifications. Proper surface preparation and installation are required to meet the allowed resistance measurement between the bond and the structure.

By the end of this course, you will be able to

- Install a pre-installed ground stud
- Check resistance on a pre-installed ground stud

Estimated completion time (hours): 1.4

Aerospace Electrical Bond and Ground Project

AER-4049 Electrical Fay Surface Bonds

Course Description

Surface bonding is assembling airplane components in a metal-to-metal contact manner. Proper surface preparation and installation are required to meet the allowed resistance measurement between the bond and the structure.

By the end of this course, you will be able to

- Prepare the surfaces of a fay surface bond
- Install a ground stud in two pieces of material
- Check resistance on a ground stud

Estimated completion time (hours): 1.5

Aerospace Electrical Bond and Ground Project

AER-4050 Direct Ground Stud

Course Description

Bonding and grounding ensures that all electrical energy within the airplane flows per engineering specifications. Proper surface preparation and installation are required to meet the allowed resistance measurement between the bond and the structure.

In this course, you will learn how to install and test resistance on a direct ground stud.

By the end of this course, you will be able to

- Install a direct ground stud
- Check resistance on a direct ground stud

Estimated completion time (hours): 1.4

Aerospace Electrical Bond and Ground Project

AER-4051 Fillet Sealing a Ground Stud

Course Description

After ground studs are installed, it is sometimes a requirement of the specifications to fillet seal the ground stud.

By the end of this course, you will be able to

- Apply a fillet seal on a direct ground stud installation

Estimated completion time (hours): 0.7

Aerospace Electrical Bond and Ground Project

AER-4052 Fay Sealing a Direct Ground Stud

Course Description

As ground studs are installed, it is sometimes a requirement of the specifications to fay seal the ground stud.

By the end of this course, you will be able to

- Apply a fay seal on a direct ground stud installation
- Check resistance on a direct ground stud installation with a fay seal

Estimated completion time (hours): 0.9

Aerospace Wire Bundle Installation Project

AER-4053 Clearance and Separation

Course Description

Installing wire bundles correctly in an airplane requires following specific paths and also providing adequate distance between a wire bundle and other bundles or other components.

By the end of this course, you will be able to

- Understand wire bundle clearance
- Understand wire bundle separation
- List methods to provide separation
- List the problems caused by improper separation
- List the problems caused by improper clearance

Estimated completion time (hours): 0.9

Aerospace Wire Bundle Installation Project

AER-4054 Minimum Bend Radius

Course Description

Installing wire bundles correctly in an airplane requires following specific paths and also providing adequate distance between a wire bundle and other bundles or other components.

By the end of this course, you will be able to

- Understand wire bundle clearance
- Understand wire bundle separation
- List methods to provide separation
- List the problems caused by improper separation
- List the problems caused by improper clearance

Estimated completion time (hours): 1.5

Aerospace Wire Bundle Installation Project

AER-4055 Clamping Wire Bundles – Part One

Course Description

Wire bundles must be clamped to secure them to the structure or equipment of an airplane. Understanding how to clamp a wire bundle is very important to installing wire bundles correctly.

By the end of this course, you will be able to

- Understand the proper alignment of a clamp to a wire bundle
- List the different types of filler
- List how a properly clamped wire bundle is allowed to move
- List the properties of a properly clamped wire bundle that contains coax cables
- Understand how to distribute slack in a wire bundle

Estimated completion time (hours): 1.8

Aerospace Wire Bundle Installation Project

AER-4056 Tying Wire Bundles for the Wire Bundle Installation Project

Course Description

Wire bundles must be tied to prevent vibration of the wires and expansion of the bundle between clamping points. Understanding how and where to tie a wire bundle is very important to installing wire bundles correctly.

By the end of this course, you will be able to

- List the general tying requirements in different areas of an airplane
- List the parts of a cable tie gun
- Understand the special requirements of tying wire bundles containing fiber optic cables
- Understand how to tie wire bundles where wires exit the bundle
- Tie four different knots with lacing tape

Estimated completion time (hours): 0.9

Aerospace Wire Bundle Installation Project

AER-4057 Project Installation Plan

Course Description

The installation plan is the build authority for an airplane. This document becomes part of the legal record of the work completed on the airplane. Understanding the installation plan for this project will ensure a proper installation.

By the end of this course, you will be able to

- Understand the sections of an installation plan
- Determine from the installation plan which materials are needed for the project
- Understand specific requirements of the installation plan
- List other installation plans that are associated with this project

Estimated completion time (hours): 0.8

Aerospace Wire Bundle Installation Project

AER-4058 Project and Drawing Review

Course Description

Properly installing wire bundles in an airplane requires careful planning. Comparing the area of the installation to the production illustration is an important step in the planning process.

By the end of this course, you will be able to

- Understand the use of a stand-off
- Identify an attach point bubble on the production illustration
- Use the attach point reference table to identify drawings associated with attach points
- Recognize that a production illustration may represent the completion of several installation plans

Estimated completion time (hours): 0.8

Aerospace Wire Bundle Installation Project

AER-4059 Pre-routing Wire Bundles

Course Description

Properly installing wire bundles in an airplane requires carefully laying out the wire bundles along their required paths before clamping them in position. This process is called pre-routing.

By the end of this course, you will be able to

- Determine the starting point of a wire bundle installation
- Pre-route wire bundles per the production illustration
- Identify and pre-route breakouts
- Identify the proper locations of flag markers

Estimated completion time (hours): 2.2

Aerospace Wire Bundle Installation Project

AER-4060 Clamping Wire Bundles – Part Two

Course Description

Properly clamping wire bundles in an airplane requires a thorough understanding of the requirements on a production illustration and installation plan.

By the end of this course, you will be able to

- Identify hardware requirements on a production illustration
- Identify types of clamps required on a production illustration
- Position clamps properly at attach points on a project
- Understand the allowable distance between ties in areas of the airplane

Estimated completion time (hours): 2.7

Aerospace Wire Bundle Installation Project

AER-4061 Torque and Inspection

Course Description

The bolts that hold the wire bundle clamps must be tightened to a specific torque to prevent loosening of the bolt or damage to the components.

By the end of this course, you will be able to

- Identify the proper torque for a bolt from the information in the installation plan
- List items to inspect upon completion of a wire bundle installation

Estimated completion time (hours): 1.1

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AUTOMATION SKILLS COURSES

Introduction to Industrial Automation

AUT-1001 Introduction to Automation

Course Description

Automation is the use of devices, machines, and control systems to decrease the need for human work. Automated systems are used in numerous industries due to their economic benefits. Understanding of automation, its benefits, and the power sources used in automated systems is important to the success of an automation technician.

By the end of this course, you will be able to

- Understand the role and importance of automated processes
- List the power sources of some automated processes
- Identify different types of components used in pneumatic/electro-pneumatic installations or circuits

Estimated completion time (hours): 0.8

Introduction to Industrial Automation

AUT-1002 Automated Process

Course Description

Automated systems are capable of performing a wide variety of tasks and processes. Even though the specific design of each automated system may vary, most share the same basic types of components.

By the end of this course, you will be able to

- Identify different assembly process steps
- Identify two types of process checks
- Define SCADA

Estimated completion time (hours): 1.1

Introduction to Industrial Automation

AUT-1003 Automated System

Course Description

At a basic level, all automated systems work in the same way regardless of their size or task. Understanding of the basic operations and communication performed in an automated system is the first step to understanding how to maintain them.

By the end of this course, you will be able to

- Identify the components and stations of the SMC MAP 205 system
- Identify the assembly steps performed at each station
- Identify common manipulator types used in a pneumatic system

Estimated completion time (hours): 1.7

Process Controls

AUT-2001 Introduction to Process Controls

Course Description

Process control systems are present in almost all modern automated and engineering systems. These systems are key to increasing productivity, maintaining quality, and improving safety.

By the end of this course, you will be able to

- Define a process
- Define a control
- List categories of processes
- Define an open-loop control system
- Define a closed-loop control system
- Identify the advantages of using process control

Estimated completion time (hours): 1.1

Process Controls

AUT-2002 Process Control Systems

Course Description

Process control systems are used in processes as simple as filling a tank with liquid and as complex as chemical engineering. However, the fundamentals and terminology are consistent for all control systems.

By the end of this course, you will be able to

- Identify the basic components of manual and automatic control systems
- Identify the signal types in an automatic control system
- List the advantages of a manual control system
- List the advantages of an automatic control system
- List factors that cause errors in a process control system

Estimated completion time (hours): 1.7

Process Controls

AUT-2003 Set Point/Comparator

Course Description

Two key components of an automated process control system are the set point and the comparator. The set point device establishes a value for the desired state. The comparator device calculates how far the process is from this value.

By the end of this course, you will be able to

- List examples of set point devices
- Define an op-amp device
- List the functions that a comparator performs on feedback and input signals
- Understand how an error signal is produced in a differential amplifier
- Define gain

Estimated completion time (hours): 1.0

Process Controls

AUT-2004 Controller (PID Control)

Course Description

Keeping modern industrial automated systems under control can require high-level calculations and decisions. The controller is the component in a feedback loop that makes the calculations and decisions.

By the end of this course, you will be able to

- Identify the purpose of the controller in an automatic control system
- Understand the differences between proportional, integral, and derivative controls
- Identify the major types of PID controllers
- Define loop tuning
- Identify the major methods of loop tuning

Estimated completion time (hours): 1.5

Process Controls

AUT-2005 Multivariate Processes

Course Description

Industrial processes often require the control of several variables to achieve the desired state of a finished product. This course will discuss controlling these multivariate processes.

By the end of this course, you will be able to

- Define a multivariate process
- Identify the key features of a multivariate process
- Identify applications of multivariate process controls
- Understand the terms coupling and decoupling

Estimated completion time (hours): 1.2

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CNC MACHINING SKILLS COURSES

Introduction to Machining

CNC-1001 Introduction to Machining

Course Description

Machining is a process of utilizing a machine to shape, assemble, or remove excess material to produce a final product. In manufacturing, machining is primarily used to remove metal. Almost every product produced by manufacturing involves the use of metals. Metals are used in the end product, manufacturing of the end product, or both.

By the end of this course, you will be able to

- Identify different classifications of tools
- List methods of removing metal
- List methods of shaping metal
- List common machining operations

Estimated completion time (hours): 1.5

Introduction to Machining

CNC-1002 Machine Tools

Course Description

The machines used to shape or remove metal are called machine tools. Thousands of machine tools are available to perform either a specific type of machining operation or multiple machining operations. Companies often use a variety of machine tools to produce a single final product.

By the end of this course, you will be able to

- Identify different classifications of machine tools
- List different methods of controlling a machine tool
- List the advantages of manual, automatic, and CNC controlled machine tools
- Identify the major areas of a CNC control

Estimated completion time (hours): 0.8

Introduction to Machining

CNC-1003 CNC Controllers

Course Description

CNC machine tools are an integral part of manufacturing today. Almost every manufactured product either uses a CNC machine in its production or a tool that was manufactured on a CNC machine.

By the end of this course, you will be able to

- Understand the history of CNC machine tools
- Identify the major areas of a CNC controller
- Identify common features on a CNC controller

Estimated completion time (hours): 1.0

Introduction to Machining

CNC-1004 Machining Personnel

Course Description

Companies often use a variety of machine tools to produce a single final product. Companies also require personnel with varying levels and areas of expertise to utilize these machine tools efficiently to produce the product.

By the end of this course, you will be able to

- Identify different classifications of machining personnel
- Identify the duties and requirements of various personnel classifications
- Recognize the available career paths for production CNC operators

Estimated completion time (hours): 0.9

Introduction to Machining

CNC-1005 Facility Layout

Course Description

A manufacturing company places departments, machines, and other equipment in various arrangements to minimize the time and cost of manufacturing its products.

By the end of this course, you will be able to

- Define facility layout
- Identify different classifications of manufacturing facility layouts
- List the advantages of each facility layout
- Recognize the factors that determine which facility layout is chosen

Estimated completion time (hours): 1.5

CNC Horizontal Lathe

CNC-2001 Components of a CNC Lathe

Course Description

A computer numerical control (CNC) lathe is made up of many different components that work together and enable you to create machined, cylindrical parts. Learning about the components of a CNC lathe will give you a foundation of knowledge to build on as you advance in your training to become a CNC operator.

By the end of this course, you will be able to

- Define a CNC lathe
- List the components of a CNC lathe
- Describe the purpose of each component
- Describe how the axis assemblies move the tool turret

Estimated completion time (hours): 1.2

CNC Horizontal Lathe

CNC-2002 Movements of a CNC Lathe

Course Description

A CNC lathe moves on two axes of travel. It uses a machine coordinate system and a part coordinate system to identify positions on the axes. Learning about how a CNC lathe moves and identifies positions will help you understand how the geometry of a part is defined and how the part is machined.

By the end of this course, you will be able to

- Define movements on the Z-axis
- Define movements on the X-axis
- Describe the machine coordinate system
- Define machine home
- Describe the part coordinate system
- Define part zero
- Describe how ordered pairs are used to define the geometry of a part

Estimated completion time (hours): 0.9

CNC Horizontal Lathe

CNC-2003 Workholding Devices and Tooling for a CNC Lathe

Course Description

Different types of workholding devices and different options for mounting tools make a computer numerically controlled (CNC) lathe versatile. Learning about these options will give you a better understanding of how a CNC lathe works.

By the end of this course, you will be able to

- Identify common workholding devices
- List the components of a chuck system
- List the components of a collet system
- Define two options for mounting tools on the tool turret

Estimated completion time (hours): 1.0

CNC Horizontal Lathe

CNC-2004 The CNC Controller for a CNC Lathe

Course Description

The CNC controller is a computer numerical control (CNC) device that directs the motions of the machine tool. Understanding the parts of the CNC controller and how they operate will enable you to operate a CNC lathe accurately and efficiently.

By the end of this course, you will be able to

- Identify the five main areas of the CNC controller
- Describe how the operator controls work
- List the areas of the display screen
- List the areas of the keyboard
- Describe how the Shift key works
- Describe the side panel controls

Estimated completion time (hours): 1.1

CNC Horizontal Lathe

CNC-2005 Auxiliary Systems for a CNC Lathe

Course Description

The lubrication, coolant, and chip removal systems keep the CNC lathe components lubricated and free from dirt and debris. These systems are essential to the consistent production of quality products.

By the end of this course, you will be able to

- Describe how the lubrication system works
- Describe how the coolant system works
- Describe how the chip removal system works

Estimated completion time (hours): 0.8

CNC Vertical Machining Center

CNC-2006 Components of a CNC Machining Center

Course Description

A computer numerical control (CNC) machining center is made up of many different components that work together and enable you to create machined parts. Learning about the components of a CNC machining center will give you a foundation of knowledge to build on as you advance in your training to become a CNC operator.

By the end of this course, you will be able to

- Define a CNC machining center
- List the components of a CNC machining center
- Describe the purpose of each component
- Describe how the axis assemblies move the spindle head assembly and the table

Estimated completion time (hours): 1.2

CNC Vertical Machining Center

CNC-2007 CNC Machining Center Movements

Course Description

A CNC machining center moves on three axes of travel. It uses a machine coordinate system and a part coordinate system to identify positions on the axes. Learning about how a CNC machining center moves and identifies positions will help you understand how the geometry of a part is defined and how the part is machined.

By the end of this course, you will be able to

- Define movements on the Z-axis
- Define movements on the Y-axis
- Define movements on the X-axis
- Describe the machine coordinate system
- Define machine home
- Describe the part coordinate system
- Define part zero
- Describe how ordered triplets are used to define the geometry of a part

Estimated completion time (hours): 0.9

CNC Vertical Machining Center

CNC-2008 Workpiece and Tool Holding Devices for a CNC Machining Center

Course Description

Different types of workholding devices and tool holders make a computer numerically controlled (CNC) machining center versatile. Learning about workholding devices and tool holders will give you a better understanding of how a CNC machining center works.

By the end of this course, you will be able to

- Identify common workholding devices
- List the components of a vise
- List the components of a fixture
- List the components of a tool holder
- Describe how an automatic tool change occurs

Estimated completion time (hours): 0.9

CNC Vertical Machining Center

CNC-2009 The CNC Controller for a CNC Machining Center

Course Description

The CNC controller is a computer numerical control (CNC) device that directs the motions of the

machine tool. Understanding the parts of the CNC controller and how they operate will enable you to operate a CNC machining center accurately and efficiently.

By the end of this course, you will be able to

- Identify the five main areas of the CNC controller
- Describe how the operator controls work
- List the areas of the display screen
- List the areas of the keyboard
- Describe how the Shift key works
- Describe the side panel controls

Estimated completion time (hours): 1.1

CNC Vertical Machining Center

CNC-2010 Auxiliary Systems for a CNC Machining Center

Course Description

The lubrication, coolant, and chip removal systems keep the CNC machining center components lubricated and free from dirt and debris. These systems are essential to the consistent production of quality products.

By the end of this course, you will be able to

- Describe how the lubrication system works
- Describe how the coolant system works
- Describe how the chip removal system works

Estimated completion time (hours): 0.8

CNC Machine Lubricants

CNC-2011 CNC Machine Lubricants

Course Description

Lubricants are critical to the operation and performance of CNC machines. It is important to understand the uses and purposes of the main types of lubricants.

By the end of this course, you will be able to

- Distinguish between lubricating oils and greases
- Identify advantages of grease over lubricating oil

- Identify ingredients in lubricating oil and grease
- Define viscosity

Estimated completion time (hours): 1.1

CNC Horizontal Lathe Applications

CNC-4001 Maintenance Tasks for a CNC Lathe

Course Description

As a CNC operator, you will be responsible for tasks related to maintaining the machine tool. Properly maintaining the machine tool helps to ensure it stays in good working order.

By the end of this course, you will be able to

- Describe how to check the coolant level
- Describe how to fill the coolant tank
- Describe how to check the air pressure
- Describe how to check the level of lubricating oil
- Describe how to check the level of grease
- Describe how to check the level of hydraulic oil

Estimated completion time (hours): 0.8

CNC Horizontal Lathe Applications

CNC-4002 Power on the CNC Lathe

Course Description

In this lesson, you will learn about the power-on process. The power-on process turns on the electrical power to the CNC lathe.

Estimated completion time (hours): 0.9

CNC Horizontal Lathe Applications

CNC-4003 Move the Axes by Rotating the Jog Handle on a CNC Lathe

Course Description

In this lesson, you will learn about moving the axes manually by rotating the Jog Handle. This is sometimes called jogging, or hand jogging, the axes.

Estimated completion time (hours): 0.8

CNC Horizontal Lathe Applications

CNC-4004 Home the Axes on a CNC Lathe

Course Description

In this lesson, you will learn about homing the axes. Homing the axes sends the axes to the machine-home position. Homing the axes is also called zero returning the axes.

Estimated completion time (hours): 0.7

CNC Horizontal Lathe Applications

CNC-4005 Select a Part Program from Memory on a CNC Lathe

Course Description

In this lesson, you will learn about selecting a part program from memory. Multiple part programs can be stored in the CNC controller, but only one part program can be active at a time. Selecting a part program loads it into the memory of the CNC controller and makes it active so that it can be used to machine parts.

Estimated completion time (hours): 0.7

CNC Horizontal Lathe Applications

CNC-4006 Start the Part Program Safely on a CNC Lathe

Course Description

In this lesson, you will learn how to start the part program in a safe manner.

Estimated completion time (hours): 0.8

CNC Horizontal Lathe Applications

CNC-4007 Interrupt Automatic Operation on a CNC Lathe

Course Description

In this lesson, you will learn how to interrupt automatic operation. Interrupting automatic operation is the process of stopping the motion of the axes, the rotation of the spindle, and the flow of the coolant.

Estimated completion time (hours): 0.7

CNC Horizontal Lathe Applications

CNC-4008 Adjust a Tool Wear Offset on a CNC Lathe

Course Description

In this lesson, you will learn to adjust the tool wear offset in the CNC controller. Adjusting the tool wear offset is necessary because, as cutting tools wear, the dimensions they are machining may increase or decrease. The tool wear offset process allows you to change the position of the cutting tool to compensate for the tool wear.

Estimated completion time (hours): 0.7

CNC Horizontal Lathe Applications

CNC-4009 Power Off the CNC Lathe

Course Description

In this lesson, you will learn about the power-off process. The power-off process prepares the CNC lathe to be shut down and then turns the power off.

Estimated completion time (hours): 0.7

CNC Lathe Programs

CNC-4010 CNC Programming Procedure for a CNC Lathe

Course Description

CNC lathes require a program to maximize the machine's capabilities. Creating a CNC program is only performed after a careful planning stage to determine exactly what machining operations and which part dimensions the CNC lathe will need to machine.

By the end of this course, you will be able to

- Define a CNC program
- Define the steps in CNC programming
- Understand the importance of thoroughly planning the creation of a CNC program
- Define program zero
- Distinguish between machine zero and program zero
- List common points used as a program zero
- List methods of creating a CNC program

Estimated completion time (hours): 1.2

CNC Lathe Programs

CNC-4011 CNC Program Structure for a CNC Lathe

Course Description

A CNC lathe program is required to be organized in a specific manner for the controller to understand the instructions within the program. Each instruction must also be organized.

By the end of this course, you will be able to

- Define a stop code
- Define an end of block symbol
- Understand the use of parentheses in a CNC program
- List the two sections of a CNC lathe program
- Distinguish between a block and a word
- Understand the purpose of the program end function

Estimated completion time (hours): 1.0

CNC Lathe Programs

CNC-4012 CNC Addresses for a CNC Lathe

Course Description

The address of a word in a CNC program defines the meaning of the word. Understanding the meaning of common words in a CNC program is important to recognize what actions the CNC machine tool will perform.

By the end of this course, you will be able to

- Define the purpose of G codes
- Define the purpose of S, T, and M words
- Understand the importance of G code groups
- Define the meaning of common G codes
- Define the meaning of common M words
- Understand the numeric value of a T word
- Understand the importance of the format of the numeric data in a word

Estimated completion time (hours): 2.1

CNC Lathe Programs

CNC-4013 CNC Lathe Commands

Course Description

The instructions written in G code programming that produce an action by a CNC lathe are called commands. A command may require a single word, a block, or multiple blocks.

By the end of this course, you will be able to

- Understand the requirements to command a spindle function
- Understand the requirements to command a linear movement
- Understand the requirements to command a circular movement

Estimated completion time (hours): 1.0

CNC Lathe Programs

CNC-4014 Organizing a CNC Program for a CNC Lathe

Course Description

Building a CNC lathe program that is versatile requires organizing sections into an order that will safely produce a part that meets all of the required specifications.

By the end of this course, you will be able to

- List common commands used in each section of the body of a CNC program
- Define a safe start block

Estimated completion time (hours): 0.8

CNC Vertical Machining Center Applications

CNC-4015 Maintenance Tasks for a CNC Machining Center

Course Description

As a CNC operator, you will be responsible for tasks related to maintaining the machine tool. Properly maintaining the machine tool helps to ensure it stays in good working order.

By the end of this course, you will be able to

- Describe how to check the coolant level
- Describe how to fill the coolant tank
- Describe how to check the air pressure
- Describe how to check the level of lubricating oil
- Describe how to check the level of grease

Estimated completion time (hours): 0.7

CNC Vertical Machining Center Applications

CNC-4016 Power on the CNC Machining Center

Course Description

In this lesson, you will learn about the power-on process. The power-on process turns on the electrical power to the CNC machining center.

Estimated completion time (hours): 0.9

CNC Vertical Machining Center Applications

CNC-4017 Move the Axes by Rotating the Jog Handle on a CNC Machining Center

Course Description

In this lesson, you will learn about moving the axes manually by rotating the Jog Handle. This is sometimes called jogging, or hand jogging, the axes.

Estimated completion time (hours): 0.8

CNC Vertical Machining Center Applications

CNC-4018 Home the Axes on a CNC Machining Center

Course Description

In this lesson, you will learn about homing the axes. Homing the axes sends the axes to the machine-home position. Homing the axes is also called zero returning the axes.

Estimated completion time (hours): 0.7

CNC Vertical Machining Center Applications

CNC-4019 Select a Part Program from Memory on a CNC Machining Center

Course Description

In this lesson, you will learn about selecting a part program from memory. Multiple part programs can be stored in the CNC controller, but only one part program can be active at a time. Selecting a part program loads it into the memory of the CNC controller and makes it active so that it can be used to machine parts.

Estimated completion time (hours): 0.7

CNC Vertical Machining Center Applications

CNC-4020 Start the Part Program Safely on a CNC Machining Center

Course Description

In this lesson, you will learn how to start the part program in a safe manner.

Estimated completion time (hours): 0.8

CNC Vertical Machining Center Applications

CNC-4021 Interrupt Automatic Operation on a CNC Machining Center

Course Description

In this lesson, you will learn how to interrupt automatic operation of the machining center. Interrupting automatic operation is the process of stopping the motion of the axes, the rotation of the spindle, and the flow of the coolant.

Estimated completion time (hours): 0.7

CNC Vertical Machining Center Applications

CNC-4022 Adjust a Tool Wear Offset on a CNC Machining Center

Course Description

In this lesson, you will learn to adjust the tool wear offset in the CNC controller. Adjusting the tool wear offset is necessary because, as cutting tools wear, the dimensions they are machining may increase or decrease. The tool wear offset process allows you to change the position of the cutting tool to compensate for the tool wear.

Estimated completion time (hours): 0.7

CNC Vertical Machining Center Applications

CNC-4023 Power Off the CNC Machining Center

Course Description

In this lesson, you will learn about the power-off process. The power-off process prepares the CNC machining center to be shut down and then turns the power off.

Estimated completion time (hours): 0.7

CNC Machining Center Programs

CNC-4024 CNC Programming Procedure for a CNC Machining Center

Course Description

A CNC machining center requires a program to maximize the machine's capabilities. Creating a CNC program is only performed after a careful planning stage to determine exactly what machining operations and which part dimensions the CNC machining center will need to machine.

By the end of this course, you will be able to

- Define a CNC program
- Define the steps in CNC programming
- Understand the importance of thoroughly planning the creation of a CNC program
- Define program zero
- Distinguish between machine zero and program zero
- Explain the relationship between work offsets, machine zero, and program zero
- List methods of creating a CNC program

Estimated completion time (hours): 1.2

CNC Machining Center Programs

CNC-4025 CNC Program Structure for a CNC Machining Center

Course Description

A CNC machining center program is required to be organized in a specific manner for the controller to understand the instructions within the program. Each instruction must also be organized.

By the end of this course, you will be able to

- Define a stop code
- Define an end of block symbol
- Understand the use of parentheses in a CNC program
- List the two sections of a CNC machining center program
- Distinguish between a block and a word
- Understand the purpose of the program end function

Estimated completion time (hours): 1.0

CNC Machining Center Programs

CNC-4026 CNC Addresses for a CNC Machining Center

Course Description

The address of a word in a CNC machining center program defines the meaning of the word. Understanding the meaning of common words in a CNC program is important to recognize what actions the CNC machine tool will perform.

By the end of this course, you will be able to

- Define the purpose of G codes
- Define the purpose of S, T, and M words
- Understand the importance of G code groups
- Define the meaning of common G codes
- Define the meaning of common M words
- Understand the numeric value of a T word
- Understand the importance of the format of the numeric data in a word

Estimated completion time (hours): 2.2

CNC Machining Center Programs

CNC-4027 CNC Machining Center Commands

Course Description

The instructions written in G code programming that produce an action by a vertical CNC machining center are called commands. A command may require a single word, a block, or multiple blocks.

By the end of this course, you will be able to

- Understand the requirements to command a tool change function
- Understand the requirements to command a spindle function
- Understand the requirements to command a linear movement
- Understand the requirements to command a circular movement
- Understand the requirements for canned cycle commands

Estimated completion time (hours): 1.7

CNC Machining Center Programs

CNC-4028 Organizing a CNC Program for a CNC Machining Center

Course Description

Building a CNC machining center program that is versatile requires organizing sections into an order that will safely produce a part that meets all of the part's requirements.

By the end of this course, you will be able to

- List common commands used in each section of the body of a CNC program
- Define a safe start block

Estimated completion time (hours): 0.8

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COMPOSITES SKILLS COURSES

Introduction to Composites

CMP-1001 Background and History of Composites

Course Description

Composites are everywhere in our lives. Understanding the background and history of composites is important information in understanding their use.

By the end of this course, you will be able to

- Define a composite material
- List the two constituents of composite materials
- List types of composite materials
- List the major purpose of a binder
- List the major purpose of a reinforcement

Estimated completion time (hours): 0.7

Introduction to Composites

CMP-1002 Composite Industries and Products

Course Description

Composite materials are used in many industries to manufacture a wide variety of products. Understanding the uses of composite materials helps to understand the benefit of using them.

By the end of this course, you will be able to

- Identify industries that use composite materials
- Identify products that are made of composite material
- List the three main types of fibers used in composite material

Estimated completion time (hours): 0.8

Introduction to Composites

CMP-1003 Advantages and Disadvantages of Composites

Course Description

Engineers can choose from a variety of materials when designing a new product. Understanding the advantages and disadvantages of composite materials is important information in understanding why they are chosen for a product.

By the end of this course, you will be able to

- List advantages of fiber reinforced plastic composite materials
- List disadvantages of fiber reinforced plastic composite materials
- List factors determining the type of material used in a product

Estimated completion time (hours): 1.1

Introduction to Composites

CMP-1004 Safety and Hazards of Composites

Course Description

The materials used to produce composite products have certain hazards associated with them that can affect the safety of personnel. Understanding these hazards is important information for anyone working with composite materials.

By the end of this course, you will be able to

- Identify hazards associated with fiber material
- Identify hazards associated with matrix materials
- Be familiar with methods of how to minimize the hazards of handling composite materials, resins and associated items

Estimated completion time (hours): 0.8

Composites Manufacturing Facilities

CMP-1005 Facility Layout

Course Description

The efficient manufacturing of any product is highly dependent on the arrangement of the departments, equipment, and personnel within a building. This arrangement is referred to as the facility layout.

By the end of this course, you will be able to

- Define facility layout
- Identify different classifications of manufacturing facility layouts
- List the advantages of each facility layout
- Recognize the factors that determine which facility layout is chosen

Estimated completion time (hours): 1.1

Composites Manufacturing Facilities

CMP-1006 Non-controlled Contamination Areas

Course Description

In a composite manufacturing facility, controlled contamination areas are separated from areas that produce contamination or are exposed to contamination.

By the end of this course, you will be able to

- List areas separated from controlled contamination areas
- List methods of separating controlled contamination areas from non-controlled areas

Estimated completion time (hours): 0.7

Composites Manufacturing Facilities

CMP-1007 Lay-up Area

Course Description

The layup area is a critical section of a composite manufacturing facility. Proper layout and organization of the layup area is critical to efficiently producing quality composite parts.

By the end of this course, you will be able to

- List items typically found in the layup area
- List different workstation configurations used in the layup area

Estimated completion time (hours): 0.8

Composites Manufacturing Facilities

CMP-1008 Curing Area

Course Description

The curing area is a section of a composite manufacturing facility where materials become true composite parts. Proper layout and organization of the curing area is critical to efficiently producing cured composite parts.

By the end of this course, you will be able to

- List items typically found in the curing area
- List common activities of technicians in the curing area

Estimated completion time (hours): 0.7

Materials Used in Composites Manufacturing

CMP-2001 Fiber Based Composites

Course Description

Fiber based composites are often referred to as advanced composites. Understanding the forms in which fiber is made is important information for anyone working with fiber reinforced composites.

By the end of this course, you will be able to

- Identify common fiber materials used in advanced composites
- Define tow
- Define yarn
- Define filament
- Identify common forms made of fibers

Estimated completion time (hours): 0.9

Materials Used in Composites Manufacturing

CMP-2002 Fibers, Tapes and Fabrics

Course Description

There are many different applications for fibers, tapes, and fabrics in the manufacture of composite parts. Understanding the properties of each form of composite material is important information for anyone working with composite materials.

By the end of this course, you will be able to

- Understand how plies of tape can strengthen a composite part in multiple directions
- Identify common fabric weaves
- Define fabric drapability and symmetry
- Identify how the fabric weaves effect fabric properties

Estimated completion time (hours): 1.1

Materials Used in Composites Manufacturing

CMP-2003 Glass and Carbon Fibers

Course Description

The two most common materials used in fiber reinforced plastics are glass and carbon. Understanding the properties of these two fiber materials is important information for anyone working with fiber reinforced composites.

By the end of this course, you will be able to

- Define terms including tensile strength, stress, elastic range, plastic range, strain, tensile modulus, shear or rigidity modulus, and brittleness
- Describe the properties of e-glass and s-glass
- Identify the steps in the manufacturing process of glass fibers
- Describe the properties of carbon fibers
- Identify the steps in the manufacturing process of carbon fibers

Estimated completion time (hours): 1.2

Materials Used in Composites Manufacturing

CMP-2004 Matrix Types and Properties

Course Description

The matrix is an important constituent of fiber reinforced plastics. Understanding the types and properties of matrices is important information for anyone working with fiber reinforced plastics.

By the end of this course, you will be able to

- Define a polymer, monomer, and mer
- Define resin
- Define hydrocarbon
- List different polymers used as matrices
- Differentiate between thermoset and thermoplastic materials
- Define the advantages of prepreg and two-part resin systems

Estimated completion time (hours): 1.3

Materials Used in Composites Manufacturing

CMP-2005 Curing Process

Course Description

The curing process is a critical step in the production of a composite part. Understanding the curing process is important information for anyone working with composites.

By the end of this course, you will be able to

- Understand the importance of the curing process in the production of composite parts
- Define ramp rate and soak/cure time
- Understand the importance of ramp rates and soak/cure times
- Understand the difference between atmospheric, gauge, and vacuum pressure
- Distinguish between co-curing and co-bonding

Estimated completion time (hours): 1.1

Materials Used in Composites Manufacturing

CMP-2006 Honeycomb Core Materials

Course Description

Honeycomb core materials are used in sandwich structures. A sandwich structure is a structure that has two composite skin bonded to a core material.

By the end of this course, you will be able to

- Define the three stresses that interact with a honeycomb core structure
- Explain how these stresses are reduced through the use of honeycomb core materials
- List the most common types of honeycomb core materials
- Describe and differentiate between the honeycomb core materials
- List the three honeycomb core cell shapes
- Explain how honeycomb core materials are used in commercial applications
- Describe the four types of edge sealing
- List the tools that are used to cut and finish honeycomb core materials
- Describe the purpose of adhesive film in a honeycomb structure

Estimated completion time (hours): 0.9

Materials Used in Composites Manufacturing

CMP-2007 Material Compatibility

Course Description

A sandwich structure is a structure that has two composite skin panels adhesively bonded to a

core material. When different materials are used together, they must be compatible.

By the end of this course, you will be able to

- Define sandwich structures
- Explain the compatibility between carbon fiber and expanded paper, aramid, aluminum, and foam core

Estimated completion time (hours): 0.7

Materials Used in Composites Manufacturing

CMP-2008 Galvanic Reactivity

Course Description

Galvanic corrosion occurs when two materials from different positions on the galvanic scale come into contact with each other in the presence of a conductive liquid. Galvanic corrosion causes one of the materials to corrode or to be gradually eaten away.

By the end of this course, you will be able to

- Define galvanic corrosion
- Explain the galvanic scale
- Define noble metals
- List methods for preventing galvanic corrosion

Estimated completion time (hours): 0.7

Materials Used in Composites Manufacturing

CMP-2009 Core Potting Compounds

Course Description

Core potting compound is a lightweight paste resin used to fill the edges or other areas of a honeycomb core in a sandwich structure.

By the end of this course, you will be able to

- Define potting
- Define core potting compound
- Describe why core potting compound is used
- Explain material compatibility of core potting compound

Estimated completion time (hours): 0.7

Composite Material Storage

CMP-2010 Fiber Material Storage

Course Description

Proper care and storage of fiber based materials is important in producing defect-free composite parts. Understanding the care and storage requirements is important information for anyone working with composite parts.

By the end of this course, you will be able to

- List general requirements of storing fiber based materials
- Define shelf life
- Understand the effect of temperature on shelf life
- Define exposure time
- Understand how exposure time is tracked
- Define kitting
- List steps for preparing prepreg material for use

Estimated completion time (hours): 0.9

Composite Material Storage

CMP-2011 Controlled Contamination Areas

Course Description

One of the best methods of controlling contamination in composite parts is to create controlled contamination areas within the manufacturing plant. Understanding the requirements of controlled contamination areas is important information for anyone working with composite parts.

By the end of this course, you will be able to

- Define controlled contamination area
- Define the methods of controlling contamination in a controlled contamination area
- List common clothing requirements to contain contamination in a composite layup room
- Define the effects contamination has in cured composite parts

Estimated completion time (hours): 0.9

Tools Used in Composite Manufacturing

CMP-2012 Local Exhaust Ventilation

Course Description

Proper ventilation is critical for the safety of employees in manufacturing. A local exhaust ventilation system is required when a manufacturing process produces dust, smoke, fumes, or vapors that must be contained.

By the end of this course, you will be able to

- List the uses of a ventilation booth
- List the parts of a ventilation booth
- List the uses of a downdraft table
- List the parts of a downdraft table
- Describe which manufacturing processes require local exhaust ventilation

Estimated completion time (hours): 1.1

Tools Used in Composite Manufacturing

CMP-2013 Forming Tools

Course Description

The manufacturing of composite products requires many tools. In this course, you'll learn about forming tools. You'll explore the type of materials used in forming tools and also learn about the factors to consider when choosing a material.

By the end of this course, you will be able to

- Understand the various materials used in forming tools
- Understand the compatibility of tool materials with composite part materials

Estimated completion time (hours): 1.0

Tools Used in Composite Manufacturing

CMP-2014 Coefficient of Thermal Expansion

Course Description

You can calculate how much a tool or composite part increases in size when heated. In this course, you'll learn about coefficient of thermal expansion (CTE) and how to calculate the CTE of various materials.

By the end of this course, you will be able to

- Define coefficient of thermal expansion (CTE)
- Calculate the CTE of common materials

Estimated completion time (hours): 0.7

Tools Used in Composite Manufacturing

CMP-2015 Forming Tool Inspection

Course Description

Preparing a tool to produce a composite part is a critical step in the manufacture of the composite part. One of the key preparations includes inspecting the tools for common defects. In this course, you'll learn about common defects, as well as common methods of tool inspection.

By the end of this course, you will be able to

- List common defects of tools
- List common methods of inspecting tools

Estimated completion time (hours): 0.8

Tools Used in Composite Manufacturing

CMP-2016 Forming Tool Cleaning

Course Description

Preparing a tool to produce a composite part is a critical step in the manufacture of the composite part. One of the key preparations includes cleaning the tools and applying a release agent before each layup is performed. In this course, you'll learn about the steps involved in this process.

By the end of this course, you will be able to

- Describe the requirements of tool strip cleaning, tool preparation (prep) cleaning, and release agent application
- Identify when a tool prep clean is performed and when a tool strip clean is performed
- Understand how to perform a tool prep clean and a tool strip clean
- Understand how to properly apply a release agent

Estimated completion time (hours): 0.9

Tools Used in Composite Manufacturing

CMP-2017 Forming Tool Storage

Course Description

Preparing a tool to produce a composite part is a critical step in the manufacture of the composite part. Properly storing the tool is important to anyone working with tools and composite parts. In this course, you'll learn about the steps involved in preparing a tool for storage.

By the end of this course, you will be able to

- Describe the proper methods of transporting and storing tools
- List reasons for protecting tools in storage

Estimated completion time (hours): 0.7

Tools Used in Composite Manufacturing

CMP-2018 Rollers and Sweeps

Course Description

Many tools are used in the manufacturing of composite parts. In this course, you'll learn about hand tools.

By the end of this course, you will be able to

- Understand the use and care of hand tools in layup
- List guidelines for proper storage

Estimated completion time (hours): 0.6

Tools Used in Composite Manufacturing

CMP-2019 Overhead Laser System

Course Description

An overhead laser system is a valuable tool to perform a layup of a composite part. Understanding the components and operation of an overhead laser system is important for technicians performing layups.

By the end of this course, you will be able to

- Describe the purpose of an overhead laser system
- List the components of an overhead laser system
- Understand the operation of an overhead laser system
- Understand the importance of reflective targets

Estimated completion time (hours): 1.0

Composite Material Kitting

CMP-3001 Kitting with a Sheeter

Course Description

Kitting is the process of cutting and collating uncured fiber material for a composite component before the actual layup process. A sheeter is an automated cutting system used to cut sheets of fiber material. The desired length of material is input into a computer and the sheeter cuts the material to that length.

By the end of this course, you will be able to

- Define kitting
- Define a controlled contamination area
- List the personal protective equipment used when kitting with a sheeter
- List the components of a sheeter
- Describe the process of kitting with a sheeter

Estimated completion time (hours): 0.9

Composite Material Kitting

CMP-3002 Kitting by Hand

Course Description

Kitting is the process of cutting and collating uncured fiber material for a composite component before the actual layup process.

By the end of this course, you will be able to

- Define kitting
- Define a controlled contamination area
- List the personal protective equipment used when kitting by hand
- Evaluate ply orientation using a rosette
- Describe the process of kitting by hand
- List operator responsibilities for kitting by hand

Estimated completion time (hours): 0.8

Composite Material Kitting

CMP-3003 Kitting with Automated Machines

Course Description

Kitting is the process of cutting and collating uncured fiber material for a composite component before the actual layup process. An automated cutting machine is a cutting system used to cut shapes out of fiber material. A knife moves across the fiber material cutting the shapes. The movements of the knife are controlled by the computer.

By the end of this course, you will be able to

- Define kitting
- Define a controlled contamination area
- List the personal protective equipment used when kitting with automated machines
- List the components of an automated cutting machine
- Describe the process of kitting with an automated cutting machine

Estimated completion time (hours): 0.9

Composite Part Layup and Bagging

CMP-3004 Ply Balancing

Course Description

A composite part increases its strength by adding plies with fibers at different orientations. Engineers use computers and software to design composite parts and determine the number and orientations of each ply so that the finished composite part will be strong enough to withstand expected and unexpected loads in the final product.

By the end of this course, you will be able to

- Define the differences between a balanced and unbalanced layup
- Understand the effects both balanced and unbalanced layups have on the finished composite part's strength

Estimated completion time (hours): 0.9

Composite Part Layup and Bagging

CMP-3005 Material Splicing

Course Description

In very large or complex composite parts, it is often necessary to make a complete ply layer out of two or more pieces of material. When two or more pieces are used to form a ply layer, the pieces must be positioned so that they will bond together during curing to form a continuous layer in the finished part. The area where these pieces are joined together is called a splice.

By the end of this course, you will be able to

- Define and identify the use of a butt splice
- Define and identify the use of an overlap splice
- List common requirements of a butt splice
- List common requirements of an overlap splice
- List common requirements for staggering splices

Estimated completion time (hours): 0.8

Composite Part Layup and Bagging

CMP-3006 Wrinkles and Gaps

Course Description

In composite manufacturing, a wrinkle is an area of a ply that does not lay flat and smooth. The plies overlap, buckle, or fold back on themselves. A gap is an unintended separation between the fibers in a ply.

By the end of this course, you will be able to

- Define wrinkle
- Define gap
- Describe the consequences of wrinkles and gaps
- List ways to prevent wrinkles and gaps
- Describe how to use the splice table on an engineering drawing

Estimated completion time (hours): 0.7

Composite Part Layup and Bagging

CMP-3007 Pockets and Voids

Course Description

In composite manufacturing, a void is an area of unintended separation between the layers of the finished composite part. Voids are also called pockets.

By the end of this course, you will be able to

- Define void
- Define porosity
- List the causes of voids and porosity
- Describe the consequences of a void or porosity
- List ways that voids and porosity can be prevented

Estimated completion time (hours): 0.7

Composite Part Layup and Bagging

CMP-3008 Radius Filler Fabrication by Hand

Course Description

Radius filler is fiber material used to fill a void in the laid-up composite part. The process for creating radius filler has four steps.

By the end of this course, you will be able to

- Define radius filler
- Describe the process for creating radius filler

Estimated completion time (hours): 0.7

Composite Part Layup and Bagging

CMP-3009 Advanced Bagging

Course Description

A poorly bagged part can impact the success of the curing cycle. A bag that leaks will not maintain a vacuum and the part will not be compacted as needed. A bag that is not pleated properly might rupture during the curing cycle.

Improper bagging techniques can lead to defects in the part, with the end result that the part is not acceptable and must be scrapped.

By the end of this course, you will be able to

- Describe the techniques for bagging and curing three dimensional assemblies

Estimated completion time (hours): 0.7

Composite Part Layup and Bagging

CMP-3010 Bagging and Lay-up Equipment

Course Description

Lay-up and bagging is a process for creating composite components. To perform lay-up and bagging tasks, you need to know how to use specialized equipment and materials.

By the end this course, you will be able to

- Identify the equipment and materials used in bagging and laying up composite components
- Identify the purpose of each piece of equipment
- Understand the role of the equipment in the bagging and lay-up process

Estimated completion time (hours): 1.4

Composite Part Layup and Bagging

CMP-3011 Preparation for the Lay-up Process

Course Description

Lay-up is the process for layering the composite materials when constructing a composite component. Understanding the purpose of each lay-up type is essential to your success in composite manufacturing. The type of lay-up will determine the structural properties of the composite component.

By the end of this course, you will be able to

- Identify the documentation used in laying up composite components
- Identify material orientation used in laying up composite components
- Understand the purpose of material orientation used in composite lay-up
- Identify different lay-up types

Estimated completion time (hours): 1.1

Composite Part Layup and Bagging

CMP-3012 Cure Cycle Controllers - Temperature Controls

Course Description

A cure cycle controller is a computer system that controls the heating elements, heating blankets, and other accessories used for curing composite structures.

By the end of this course, you will be able to

- Define cure cycle controller
- List the components of a hot bonder
- Describe how a hot bonder is programmed
- Describe the proper care and storage of a hot bonder

Estimated completion time (hours): 1.0

Composite Part Layup and Bagging

CMP-3013 Thermocouple Science

Course Description

A thermocouple is a sensor used to measure the temperature of the composite part during the curing cycle.

By the end of this course, you will be able to

- Describe thermo-management in composite manufacturing
- Understand the proper placement and number of thermocouples required for proper thermo-management of the part during the cure process
- Explain the basic science of exothermic reactions and their relation to part geometry and thickness

Estimated completion time (hours): 0.7

Inspecting Composites Parts

CMP-3014 Introduction to Inspection of Composites

Course Description

The inspection of a composite part is critical to ensuring the part meets its design requirements. This course introduces the different inspection techniques and the terms used in inspection of composite parts.

By the end of this course, you will be able to

- Understand the difference between destructive and nondestructive testing
- Understand the difference between discontinuities, indications, flaws, and defects
- List common flaws and defects of composite parts
- List common nondestructive tests used with composite parts
- Distinguish between qualified and certified NDE technicians
- Understand the responsibilities of the different levels of NDE technicians

Estimated completion time (hours): 1.5

Inspecting Composites Parts

CMP-3015 Visual Inspection for Composites

Course Description

Visual inspection of a composite part is typically the first and most basic method of inspection because if a product looks bad, it probably is bad, and no further inspection may be needed.

By the end of this course, you will be able to

- List equipment used in visual inspections
- List requirements of a visual inspection
- List common defects of composite parts that can and cannot be detected in a visual inspection

Estimated completion time (hours): 1.0

Inspecting Composites Parts

CMP-3016 Ultrasonic Inspection for Composites

Course Description

Ultrasonic inspection is a nondestructive inspection method that uses vibrations to detect internal defects in a composite part.

By the end of this course, you will be able to

- Define ultrasonic inspection
- List common components of ultrasonic equipment
- List requirements of an ultrasonic inspection
- List common defects of composite parts that can and cannot be detected in an ultrasonic inspection
- List common formats displayed by ultrasonic equipment

Estimated completion time (hours): 0.9

Inspecting Composites Parts

CMP-3017 Tap Inspection for Composites

Course Description

Tap inspection is the simplest method of detecting subsurface defects in a composite part. Understanding the process of a tap inspection is important information for technicians manufacturing or repairing composite parts.

By the end of this course, you will be able to

- Define a tap inspection
- List requirements of a tap inspection
- Describe the process of performing a tap inspection
- Use the correct technique to tap composite parts
- Identify different devices used in tap inspections

Estimated completion time (hours): 1.2

Composite Part Damage and Repair

CMP-3018 Composite Repairs

Course Description

Repairing damage to a composite aircraft is a complex process that requires specialized equipment, education, and training. The process of repairing composites is controlled through strict regulations and manufacturer's documentation.

By the end of this course, you will be able to

- Describe the need for regulations and documentation in composite repair
- Define the need for the Structural Repair Manual
- Explain the Structural Repair Manual numbering system
- List the potential hazards of working with composite repair materials
- Explain the composite repair process
- Understand why it is necessary to document the repair process
- Find and use the appropriate documentation during the repair process

Estimated completion time (hours): 1.0

Composite Part Damage and Repair

CMP-3019 Aircraft Damage

Course Description

An aircraft can be damaged in a variety of ways. All damage is classified into defined categories based upon the type and severity of damage. Defining the type of damage is an essential step in the composite repair process.

By the end of this course, you will be able to

- Define damage
- Identify all of the possible types of damage
- List all of the descriptions of the possible types of damage
- Define the difference between repairable and nonrepairable damage
- Define the difference between major and minor repairable damage
- List all of the descriptions of the possible types of damage
- Describe how and when to use the Structural Repair Manual during the damage assessment process

Estimated completion time (hours): 1.1

Composite Part Damage and Repair

CMP-3020 Damage Assessment

Course Description

Assessing the damage in composite structures requires specialized inspection equipment and

highly trained personnel. Understanding the tools and techniques that are used to assess damage is important.

By the end of this course, you will be able to

- Define the damage assessment process
- List the major types of damage assessment equipment
- Explain the function of each of the different types of NDE equipment
- Describe the damage mapping process

Estimated completion time (hours): 2.8

Composite Part Damage and Repair

CMP-3021 Repair Tools and Materials

Course Description

There are many different types of tools, equipment, and materials used to perform a successful composite repair. Each one has a unique purpose in the repair process.

By the end of this course, you will be able to

- List all of the tools you will need to perform a repair
- Explain the purpose of each one in the repair process
- List all of the bagging and lay-up materials you will need to perform the repair
- List all of the composite materials you will need to perform the repair

Estimated completion time (hours): 1.6

Composite Layup Projects

CMP-4001 Unidirectional 4 Ply Lay-up

Course Description

In this course, you will learn how to build a simple composite component using unidirectional, pre-impregnated composite materials.

By the end of this course you will be able to

- Build a simple composite component using unidirectional, pre-impregnated composite materials.

Estimated completion time (hours): 1.5

Composite Layup Projects

CMP-4002 Carbon 8 Ply Lay-up with Core

Course Description

In this course, you will learn how to build a complex composite component using pre-impregnated composite materials and core materials.

By the end of this course you will be able to

- Build a complex composite component using unidirectional, pre-impregnated composite materials and core materials

Estimated completion time (hours): 1.6

Composite Layup Projects

CMP-4003 Fiberglass 6 Ply Wet Lay-up

Course Description

In this course, you will learn how to build a simple composite component using fiberglass materials and liquid resins.

By the end of this course you will be able to

- Build a composite component using fiberglass cloth materials and liquid resins

Estimated completion time (hours): 1.7

Drilling Composites Project

CMP-4004 Drilling Composite Material

Course Description

To drill a quality hole in composite material, you need to have good basic drilling knowledge and skills.

By the end of this course, you will be able to

- List some qualities of composite material
- Understand the hazards of working with composite materials
- Define a quality hole
- Understand how to drill a quality hole in composite material
- Recognize some common hole defects that occur in composite materials

Estimated completion time (hours): 1.6

Drilling Composites Project

CMP-4005 Marking Hole Locations

Course Description

Before holes are drilled into this composite assembly, their locations must be marked.

By the end of this course, you will be able to

- Recognize hole location information on an engineering drawing
- Explain where to find the tools and other supplies needed to create an assembly
- Properly measure and mark hole locations in this assembly

Estimated completion time (hours): 1.0

Drilling Composites Project

CMP-4006 Drilling Pilot Holes in Titanium

Course Description

Pilot holes are typically the first holes drilled in an assembly. A quality hole starts with a properly located pilot hole created using correct drilling practices.

In this course, you will be shown how to drill pilot holes in a composite assembly.

By the end of this course, you will be able to

- Properly secure the assembly in the vise
- Install a pilot bit in a drill motor
- Drill pilot holes into an assembly

Estimated completion time (hours): 0.8

Drilling Composites Project

CMP-4007 Drilling Row JD3

Course Description

After the pilot holes are drilled in rows JD1, JD2, and JD4 through JD6, drill the pilot holes in row JD3 and then enlarge the holes to size.

By the end of this course, you will be able to

- Drill and enlarge the holes in row JD3 of the composite assembly

Estimated completion time (hours): 0.9

Drilling Composites Project

CMP-4008 Drilling Row JD7

Course Description

Once row JD3 is enlarged, drill and enlarge the holes in row JD7.

By the end of this course, you will be able to

- Drill and enlarge the holes in row JD7 of the composite assembly

Estimated completion time (hours): 0.9

Drilling Composites Project

CMP-4009 Enlarging Holes in Rows JD1 and JD5

Course Description

Once row JD7 is enlarged, enlarge the remaining rows of holes, beginning with row JD1.

By the end of this course, you will be able to

- Enlarge the holes in rows JD1 and JD5 of the composite assembly

Estimated completion time (hours): 0.8

Drilling Composites Project

CMP-4010 Enlarging Holes in Rows JD2 and JD6

Course Description

After drilling and enlarging rows JD1 and JD5, enlarge rows JD2 and JD6.

By the end of this course, you will be able to

- Enlarge the holes in rows JD2 and JD6 of the composite assembly

Estimated completion time (hours): 1.0

Drilling Composites Project

CMP-4011 Enlarging Holes in Row JD4

Course Description

After drilling and enlarging all the other rows of holes in the assembly, enlarge the holes in JD4.

By the end of this course, you will be able to

- Enlarge the holes in row JD4 of the composite assembly

Estimated completion time (hours): 0.8

Composite Part Damage and Repair Project

CMP-4012 Surface Damage Assessment

Course Description

When encountering an aircraft with suspected structural surface damage, a variety of damage assessment activities are necessary to determine the exact type and extent of the damage.

In this course, you will encounter an aircraft with suspected structural surface damage. You will perform a variety of damage assessment activities to determine the exact type and extent of this damage.

By the end of this course, you will be able to

- Perform the surface damage assessment process
- Find the required documentation for an aircraft
- Prepare an aircraft for surface damage assessment
- Perform a variety of surface damage assessment procedures
- Document your surface damage assessment results

Estimated completion time (hours): 1.1

Composite Part Damage and Repair Project

CMP-4013 Surface Damage Repair

Course Description

Repairing an aircraft with structural surface scratch damage to the original OEM standards involves several activities.

In this course, you will repair an aircraft with structural surface scratch damage. You will perform a variety of activities to repair the aircraft to the original OEM standards.

By the end of this course, you will be able to

- Perform the surface damage repair process
- Find the required documentation for the surface damage repair process
- Prepare an aircraft for surface damage repair
- Remove the surface damaged materials
- Replace the surface damaged materials
- Document your surface damage repair activities

Estimated completion time (hours): 2.1

Composite Part Damage and Repair Project

CMP-4014 Disbonding Damage Assessment

Course Description

Determining the exact type and extent of suspected structural surface damage with delamination requires several damage assessment activities.

In this course, you will encounter an aircraft with suspected structural surface damage. You will have to perform a variety of damage assessment activities to determine the exact type and extent of this damage.

By the end of this course, you will be able to

- Perform the disbonding damage assessment process
- Find the required documentation for an aircraft
- Prepare an aircraft for disbonding damage assessment
- Perform a variety of disbonding damage assessment procedures
- Document your disbonding damage assessment results

Estimated completion time (hours): 1.2

Composite Part Damage and Repair Project

CMP-4015 Disbonding Damage Repair

Course Description

Repairing an aircraft with structural disbonding damage to the original OEM standards requires

a variety of activities.

In this course, you will repair an aircraft with structural disbonding damage. You will perform a variety of activities to repair the aircraft to the original OEM standards.

By the end of this course, you will be able to

- Perform the disbonding damage repair process
- Find the required documentation for the disbonding damage repair process
- Prepare an aircraft for disbonding damage repair
- Remove the disbonding damaged materials
- Replace the disbonding damaged materials
- Document your disbonding damage repair activities

Estimated completion time (hours): 2.8

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CUTTING TOOLS SKILLS COURSES

CUT-2001 Drill Bits

Course Description

Drill bits are used in conjunction with drill motors to drill holes in workpieces. In this course, you will learn about drill bits and how to choose the right bit for the hole you are drilling.

By the end of this course, you will be able to

- List different types of drill bits
- Describe the components of a drill bit
- Describe the purpose of a reamer
- List considerations for choosing the right drill bit

Estimated completion time (hours): 0.8

CUT-2002 Drill Guides and Drill Stops

Course Description

Two commonly used drilling attachments are drill guides and drill stops. Using these attachments will make it easier to drill a quality hole.

By the end of this course, you will be able to

- List the parts of a drill guide
- Describe how a drill guide is used
- List the parts of a drill stop
- Describe how a drill stop is used
- Describe how a fixture is used
- Describe how a drill jig is used

Estimated completion time (hours): 0.9

CUT-2003 Countersinking Tools

Course Description

A countersink is a conical hole cut into material that allows the head of a fastener to sit flush with the surface of the material. Flush head fasteners improve aerodynamics, prevent trip hazards, and allow parts to be placed next to each other with no interference.

By the end of this course, you will be able to

- List the common reasons for countersinking a hole
- Identify the different types of countersink cutters
- Understand how countersinks are identified
- Describe the purpose of a microstop countersink tool
- Describe the proper technique for countersinking a hole
- Understand the proper way to use a countersink gauge

Estimated completion time (hours): 1.3

Threads, Taps and Dies

CUT-2004 Threads

Course Description

Threads are one of the most common mechanical forms used to join parts. Understanding the terms associated with threads is important for anyone working with fasteners and other parts with threads.

By the end of this course, you will be able to

- Define pitch
- Define TPI
- Identify the sections of a 60 degree thread form
- List common fastener thread series

Estimated completion time (hours): 1.3

Threads, Taps and Dies

CUT-2005 Taps

Course Description

Taps are one of the most common tools used to produce internal threads in parts. Understanding the types of taps and their applications is important for anyone working in manufacturing.

By the end of this course, you will be able to

- Identify a hand tap
- Identify a helical tap
- Identify the sections of a tap
- Understand the markings on a tap

Estimated completion time (hours): 1.5

Threads, Taps and Dies

CUT-2006 Hand Tapping

Course Description

Hand tapping is a common method of manually tapping a few holes or repairing damaged internal threads. Understanding this process is important for anyone working with parts with internal threads.

By the end of this course, you will be able to

- List types of tap wrenches
- List proper cutting fluids for tapping different materials
- Understand the process of hand tapping

Estimated completion time (hours): 1.4

Threads, Taps and Dies

CUT-2007 Threading Dies

Course Description

A threading die is a tool used to create or repair external threads. Understanding the different types of threading dies and their uses is important for anyone in manufacturing.

By the end of this course, you will be able to

- List types of threading dies
- List the parts of an adjustable threading die
- Understand the process of repairing a thread with a threading die

Estimated completion time (hours): 1.4

Lubricants and Cutting Fluids

CUT-2008 Cutting Fluids

Course Description

Cutting fluids are vital to the success of most machining operations on CNC machines. It is important to understand the properties and proper maintenance of the various cutting fluids.

By the end of this course, you will be able to

- Distinguish between cutting oil, soluble oil, and synthetic cutting fluids
- List properties of cutting oils
- List properties of synthetic cutting fluids
- List properties of soluble oil
- List ingredients in soluble oils
- Understand how to use a refractometer

Estimated completion time (hours): 1.5

Cutting Tools for Metalworking

CUT-2009 Cutting Tool Materials

Course Description

Many different types of cutting tool material are available, and how they interact with whatever you're cutting plays a key role in the success of a machining operation. In this course, you will discover the most common cutting tool types and materials. You will also find out the importance of balancing speed and feedrate, as well as the key attributes of each type of material.

By the end of this course, you will be able to

- Define speed and feed
- List common cutting tool materials
- Identify uses of common cutting tool materials
- List the attributes of common cutting tool materials
- Understand the purpose of coatings on cutting tools
- Understand the term carbide grade

Estimated completion time (hours): 1.2

Cutting Tools for Metalworking

CUT-2010 Indexable Tool Holders

Course Description

Several machining operations can use indexable tools. In this course, you'll learn the difference between indexable turning tool holders and indexable boring bar holders. You'll also discover the ins and outs of the ANSI and ISO turning tool and boring bar identification systems.

By the end of this course, you will be able to

- Identify machining operations that can use indexable tools
- List the areas of a shank-type indexable turning tool holder
- List the components of the insert clamping system
- Identify the meanings of positions in the ANSI and ISO turning tool identification system
- Define the inscribed circle of an insert

Estimated completion time (hours): 2.1

Cutting Tools for Metalworking

CUT-2011 Inserts

Course Description

Many different types of inserts exist. Fortunately, many inserts are versatile, and you can use them for multiple tasks. In this course, you'll discover the common insert shapes for CNC lathes. You'll also learn what each position in the insert identification system specifies.

By the end of this course, you will be able to

- List common shapes of inserts used for turning
- List common shapes of inserts used for milling
- Understand the importance of the tool nose radius
- Understand the ANSI insert identification system
- Define chipbreaker

Estimated completion time (hours): 1.2

Cutting Tools for Metalworking

CUT-2012 Solid Cutting Tools

Course Description

Solid cutting tools are widely used in CNC lathes and machining centers. Understanding the terms associated with these tools and how a tool is selected is important information for all CNC team members.

By the end of this course, you will be able to

- Identify terms associated with solid cutting tools
- Distinguish between right- and left-hand cutting tools
- Define straight and helical flutes
- Distinguish between right- and left-hand helical flutes
- List the categories of drill lengths
- Understand the size markings of drills
- Understand the markings on taps
- Understand the uses of right- and left-hand helix cutting tools

Estimated completion time (hours): 1.9

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ELECTRICAL SKILLS COURSES

Introduction to Electricity

ELE-1001 Production of Electricity

Course Description

Electricity is a part of modern everyday life. Understanding the methods of producing electricity can lead to a greater appreciation of its importance.

By the end of this course, you will be able to

- Understand the term energy
- List methods to produce electricity
- Understand the concept of conservation of energy
- List several forms of energy
- Understand the difference between kinetic and potential energy

Estimated completion time (hours): 1.7

Introduction to Electricity

ELE-1002 Transmission and Distribution of Electricity

Course Description

The methods to transmit and distribute electricity produced in power plants are important to understand the complete electrical network.

By the end of this course, you will be able to

- Define voltage
- List the types of substations
- Define a substation
- Understand the difference between step-up and step-down substations

Estimated completion time (hours): 1.1

Introduction to Electricity

ELE-1003 Uses of Electricity

Course Description

Electricity is used in almost every facet of our lives. Understanding the many different ways it is used is important to realizing its importance as a source of energy.

By the end of this course, you will be able to

- List industrial applications of electricity
- List ways electricity is used in households
- Understand how electricity is used in transportation
- Understand the medical applications of electricity

Estimated completion time (hours): 1.2

Introduction to Electricity

ELE-1004 Atomic Structure

Course Description

The foundation to understanding electricity begins with the atom. Identifying the parts of an atom and their characteristics will help you understand the origin and flow of electricity.

By the end of this course, you will be able to

- List the parts of an atom
- Define charge
- Define coulomb
- Understand the difference in the atomic structure of conductors and insulators
- List some conductors and insulators

Estimated completion time (hours): 0.8

Introduction to Electricity

ELE-1005 Electrical Circuits

Course Description

Knowing the types and parts of electrical circuits is important in understanding the flow of electricity.

By the end of this course, you will be able to

- List the parts of a circuit
- List the differences between series, parallel, and combination circuits
- Understand the difference between open and closed circuits

Estimated completion time (hours): 0.8

Introduction to Electricity

ELE-1006 Electrical Current

Course Description

Understanding the term electrical current and how it is measured is important to anyone working with electricity.

By the end of this course, you will be able to

- Define the term for measuring the flow of electricity
- List the prefixes associated with units of measure
- Understand the relationship between current and coulomb
- Understand how an ammeter must be installed in a circuit

Estimated completion time (hours): 0.8

Introduction to Electricity

ELE-1007 Voltage

Course Description

Understanding the term voltage and how it is measured is important to anyone working with electricity.

By the end of this course, you will be able to

- Define the term voltage
- Understand the relationship between current and voltage
- Understand how a voltmeter must be installed in a circuit

Estimated completion time (hours): 0.7

Introduction to Electricity

ELE-1008 Electrical Power

Course Description

Understanding the term electrical power and how it is measured is important to anyone working with electricity.

By the end of this course, you will be able to

- Define the term electrical power
- Understand the relationship between electrical power, current, and voltage
- Understand how a wattmeter must be connected in a circuit

Estimated completion time (hours): 0.7

Introduction to Electricity

ELE-1009 Resistance

Course Description

The resistance in a circuit determines the amount of voltage required in the circuit and the amount of current the circuit will carry. Understanding the relationship of resistance to other electrical characteristics is important to anyone working with electricity.

By the end of this course, you will be able to

- Define the term resistance
- Understand the relationship between current, voltage, and resistance
- Understand how an ohmmeter must be connected
- Identify types of resistors
- Recognize the color codes for resistors

Estimated completion time (hours): 0.9

Introduction to Electricity

ELE-1010 Ohm's Law

Course Description

Ohm's law is the mathematical representation of the relationship between voltage, current, and resistance in an electrical circuit. Understanding how to apply Ohm's law is important for anyone working with electrical circuits.

By the end of this course, you will be able to

- Define Ohm's law
- Apply Ohm's law to calculate unknown electrical values

Estimated completion time (hours): 0.7

Introduction to Electricity

ELE-1011 Watt's Law

Course Description

Watt's law is the mathematical representation of the relationship between power, current, and voltage in an electrical circuit. Understanding how to apply Watt's law is important for anyone working with electrical circuits.

By the end of this course, you will be able to

- Define Watt's law
- Apply Watt's law to calculate unknown electrical values
- Combine Watt's law and Ohm's law to calculate unknown electrical values

Estimated completion time (hours): 0.8

DC Electricity

ELE-1012 Direct Current

Course Description

Direct current is used to power everything from cell phones to trains. Understanding this form of electrical flow is important to anyone working with electricity and electronics.

By the end of this course, you will be able to

- Define direct current
- Understand the difference between conventional and electron flow theories
- List different types of direct current

Estimated completion time (hours): 0.7

DC Electricity

ELE-1013 Batteries

Course Description

Batteries are a common power source of direct current. Connecting batteries together can increase the voltage or current supplied to a circuit.

By the end of this course, you will be able to

- Define cell
- Define battery
- Understand how to connect cells or batteries to increase voltage
- Understand how to connect cells or batteries to increase current

Estimated completion time (hours): 0.7

DC Electricity

ELE-1014 Circuit Analysis

Course Description

The resistance, voltage, and current in a circuit depend upon the type of circuit. Understanding how to calculate the values for resistance, voltage, and current for each type of circuit is important for anyone working with electricity and electronics.

By the end of this course, you will be able to

- Identify a node
- Identify a junction
- Identify a loop
- Calculate total resistance in a series, parallel, or combination circuit
- Understand Kirchhoff's voltage and current laws

Estimated completion time (hours): 1.6

AC Electricity

ELE-1015 Electromagnetism

Course Description

Understanding the relationship between electricity and magnetism is important in understanding the way many electrical components function.

By the end of this course, you will be able to

- Define electromagnetism
- Define electromagnetic induction

Estimated completion time (hours): 1.1

AC Electricity

ELE-1016 AC Waveform Generation

Course Description

Magnetism is used to produce alternating current (AC). Knowing how AC is produced is important in understanding the way many electrical devices operate.

By the end of this course, you will be able to

- Define a wave cycle
- Define frequency
- Understand how an AC waveform is produced

Estimated completion time (hours): 0.7

AC Electricity

ELE-1017 Electromagnetic Devices

Course Description

The electromagnetic property of a coil of wire carrying current has many uses in electrical circuits. Understanding this property is important in understanding the way many electrical devices operate.

By the end of this course, you will be able to

- Define inductor
- Identify the symbols for inductors, solenoids, and relays
- Understand how an inductor can limit current
- Understand how a solenoid operates
- Understand how a relay operates

Estimated completion time (hours): 1.0

AC Electricity

ELE-1018 Transformers

Course Description

A common electrical device used in industrial facilities is the transformer. Identifying the components and functions of a transformer are important to anyone working with electricity.

By the end of this course, you will be able to

- Identify the components of a transformer
- Identify the functions of a transformer
- Understand the relationship between the primary and secondary coils of a transformer
- Identify the type of transformer by the ratio of turns of the conductor on the coils

Estimated completion time (hours): 0.9

AC Electricity

ELE-1019 Capacitors

Course Description

A capacitor is one of the few electrical devices capable of storing electrical energy in a circuit. Identifying the components and functions of a capacitor are important to anyone working with these devices.

By the end of this course, you will be able to

- Identify the components of a capacitor
- Identify the functions of a capacitor
- Define capacitance
- Identify the unit of measure of capacitance

Estimated completion time (hours): 0.8

Solid State Electricity

ELE-1020 Semiconductors

Course Description

Semiconductors are materials that are used extensively as the materials in electronic circuit devices. Knowledge of these materials will help in your understanding of the devices that are made from these materials.

By the end of this course, you will be able to

- Define a semiconductor
- Define an N-type material
- Define a P-type material
- List some trivalent elements
- List some pentavalent elements

Estimated completion time (hours): 0.9

Solid State Electricity

ELE-1021 Solid State Devices

Course Description

Solid state devices are used in most electronic devices. Understanding how these devices

function is important to anyone working with electronic circuits.

By the end of this course, you will be able to

- Identify symbols for diodes, rectifiers, and transistors
- Understand the importance of P-type and N-type materials in solid state devices
- Understand how a diode functions
- Understand how a rectifier functions
- List different types of power supplies

Estimated completion time (hours): 1.4

Introduction to Wiring

ELE-2001 Wires, Connectors, and Circuit Protection

Course Description

Wires, connectors, and circuit protection are important components of an electrical circuit. Understanding these components is important for anyone working with electricity.

By the end of this course, you will be able to

- List different types of grounds
- List different types of connectors
- Understand wire sizes
- List different methods of joining wires and connectors
- List different methods of circuit protection

Estimated completion time (hours): 1.5

Introduction to Wiring

ELE-2002 Connecting Transformers

Course Description

Understanding the different methods of connecting transformers is important for all people working with electricity in any industry.

By the end of this course, you will be able to

- Define phase
- Understand the difference between single- and three-phase power
- Understand how single-phase transformers are connected in series and parallel
- Understand how the coils in three-phase transformers are connected
- Understand the difference between delta and wye configurations

Estimated completion time (hours): 1.2

Introduction to Electric Motors

ELE-2003 DC Motors

Course Description

Electric motors that operate on direct current are used in everything from children's toys to the Mars Exploration Rover. Understanding the types and components of a DC motor is important for anyone working with electric motors.

By the end of this course, you will be able to

- List types of DC motors
- List common parts of a DC motor
- Define a series connected wound motor
- Define a shunt connected wound motor
- Define a compound connected wound motor

Estimated completion time (hours): 1.4

Introduction to Electric Motors

ELE-2004 AC Single-Phase Motors

Course Description

Electric motors that operate on single-phase alternating current are used in most kitchen appliances and many low power industrial machines. Understanding the types of single-phase AC motors is important for anyone working with electric motors.

By the end of this course, you will be able to

- List types of single-phase AC motors
- Define a split-phase motor
- Define a capacitor start motor
- Define a capacitor run motor

Estimated completion time (hours): 0.7

Introduction to Electric Motors

ELE-2005 Three-Phase AC Motors

Course Description

Electric motors that operate on three-phase alternating current are used in many industrial machines that require high horsepower. Understanding how a three-phase AC motor operates is important for anyone working with electric motors.

By the end of this course, you will be able to

- Understand how a three-phase motor operates
- Understand how to connect a three-phase motor with a wye configuration
- Understand how to connect a three-phase motor with a delta configuration

Estimated completion time (hours): 0.9

Electrical Connectors

ELE-2006 Electrical Connectors and Fasteners

Course Description

This course introduces electrical connectors and reviews several types of mechanical fasteners used in the installation of wire bundles in an airplane.

By the end of this course, you will be able to

- List the components of a wire bundle
- Understand the function of each component of a wire bundle
- Recognize different types of mechanical fasteners
- Understand the function of each type of mechanical fastener

Estimated completion time (hours): 1.3

Fiber Optics

ELE-2007 Fiber Optics and Light

Course Description

The continuous process of improving the performance and comfort of modern airplanes requires the use of lighter and more efficient materials. The replacement of copper wire with lighter and smaller glass fiber is possible in some areas of modern airplanes.

By the end of this course, you will be able to

- Understand how light and optic fiber is measured
- List forms of electromagnetic radiation
- Identify the parts of a fiber optic system
- Define frequency
- Define wave length
- List the components of an optic fiber
- Understand how light behaves as it travels through different materials

Estimated completion time (hours): 1.9

Fiber Optics

ELE-2008 Manufacturing Optical Fiber

Course Description

The process of manufacturing optical fiber is critical to a properly functioning fiber optic system. Learning how optical fiber is manufactured is important in understanding how light is transmitted through the fiber.

By the end of this course, you will be able to

- Define preform
- Understand how a preform is manufactured
- Define tensile strength
- List properties of an optical fiber that are tested

Estimated completion time (hours): 1.1

Fiber Optics

ELE-2009 Fiber Optic Cable

Course Description

Fibers require the strength provided by the layers of a cable to withstand the forces of installation and nature. Identifying the types of fiber optic cables is important for anyone working with fiber optic systems.

By the end of this course, you will be able to

- Define a single-mode fiber
- Define a multi-mode fiber
- Identify the layers of a fiber optic cable
- List types of fiber optic cables

Estimated completion time (hours): 0.9

Fiber Optics

ELE-2010 Handling Fiber Optic Cable

Course Description

The proper handling of a fiber optic cable is critical to the performance of the cable. Properly handling fiber optic cables is important for anyone working with fiber optic systems.

By the end of this course, you will be able to

- Define FOD
- Calculate the minimum bend radius for a fiber optic cable
- Understand how to properly handle fiber optic cable
- Understand the importance of dust caps

Estimated completion time (hours): 0.8

Fiber Optics

ELE-2011 Quality and Safety

Course Description

The quality of a fiber optic cable and its installation are critical to the performance of the fiber optic system. Understanding the risks of working with fiber optic cables is important to ensure the personal safety of anyone working with fiber optics.

By the end of this course, you will be able to

- List defects of a fiber optic cable
- List the tasks performed on fiber optic cables that require certification
- Understand your responsibility if you find a damaged cable
- Understand the risks of working with fiber optic cables

Estimated completion time (hours): 0.7

Sensor Technology

ELE-2012 Introduction to Sensors Technology

Course Description

Sensors are the communication managers of automated industrial systems. They collect information about the environment and convert this information into a format that can be used by the system. Sensor selection depends upon what information the automated system needs to acquire.

By the end of this course, you will be able to

- Define sensors
- List the primary types of sensors
- Categorize sensors based upon their capabilities
- Understand the role of sensors in automated industrial systems
- List some typical applications of sensors in automated industrial systems

Estimated completion time (hours): 1.4

Sensor Technology

ELE-2013 Sensor Technology

Course Description

Sensors have several properties and characteristics that affect their ability to detect and measure the environment and convert this information into a quantitative measurement. Understanding these characteristics will help you select the correct sensor for your application.

By the end of this course, you will be able to

- Identify the characteristics of a sensor
- Explain how each characteristic impacts sensor performance
- Describe the criteria to be considered for selecting a sensor

Estimated completion time (hours): 1.2

Sensor Technology

ELE-2014 Proximity Sensors

Course Description

Proximity sensors are typically designed to determine if an object is near and to communicate that information to another device in an automated system. Some proximity sensors simply detect if an object is present or absent, while others can measure the distance to the object. Other proximity sensors can even detect the color of an object.

By the end of this course, you will be able to

- Understand proximity sensors
- Identify the different types of proximity sensors
- Understand the function of proximity sensors
- List some typical applications of proximity sensors
- Understand the symbology for proximity sensors

Estimated completion time (hours): 1.4

Sensor Technology

ELE-2015 Position, Speed and Acceleration Sensors

Course Description

Position, speed, and acceleration sensors make it possible to move automated system components in complex ways. Controlling speed, position, and acceleration increases the efficiency of these systems as well.

By the end of this course, you will be able to

- Identify the types of position sensors
- Understand the functions and features of position sensors
- Identify the types of speed sensors
- Understand the functions and features of speed sensors
- Identify the types of acceleration sensors
- Understand the functions of features of acceleration sensors
- Recognize some typical applications of position, speed, and acceleration sensors

Estimated completion time (hours): 1.7

Sensor Technology

ELE-2016 Industrial Process Sensors

Course Description

Industrial process sensors are designed to monitor conditions of a process that are variable, such as pressure, temperature, level, and flow. These sensors enable an automated system to control complex tasks, such as mixing, filling, heating, and cooling.

By the end of this course, you will be able to

- Describe the different types of process control sensors
- Describe common applications of process control sensors
- Differentiate between mechanical and electromechanical sensors
- Understand how a strain gauge functions

Estimated completion time (hours): 1.6

Sensor Technology

ELE-2017 Advanced Sensors

Course Description

Many of the sensors you encounter in everyday life, such as barcode readers at retail stores, are also used in industrial processes. Understanding the uses of these advanced sensors is important for individuals working in these industries.

By the end of this course, you will be able to

- Identify different types of advanced sensors used in industrial applications
- Describe the uses of barcode readers
- Define the main components of a barcode reader
- Describe the uses and types of radio frequency identification
- Describe the uses and types of vision sensors
- Describe the uses and types of laser sensors
- Identify typical applications of some advanced sensors

Estimated completion time (hours): 1.6

Electrical Hand Tools

ELE-2018 Hand Tools for Electrical Wiring

Course Description

Installing wire bundles in an airplane requires the use of many different hand tools. Knowledge of the tools and their usage is valuable for the assembly electrician.

By the end of this course, you will be able to

- Understand the tools used to install wire bundles
- List some of the parts of these tools
- Understand the proper use of the tools

Estimated completion time (hours): 1.5

Electrical Measurement Conversion

ELE-2019 Electrical Measurement and Unit Conversion

Course Description

Measuring resistance is done with sophisticated electronic equipment. Understanding measurement values and being able to convert them to other units of measure is a critical skill in the aviation industry.

By the end of this course, you will be able to

- Explain how resistance is measured
- Demonstrate converting ohms to other units of measure
- List all of the units of measure for ohms
- Explain the fundamental rules for unit conversion

Estimated completion time (hours): 0.9

Electrical Resistance Test Equipment

ELE-2020 Resistance Test Equipment

Course Description

Ohmmeters and multimeters check resistance in a variety of airplane locations. Some of these areas may be hazardous. In this course, you will learn how to avoid potential danger when testing resistance.

By the end of this course, you will be able to

- Explain the potential hazards of resistance testing
- List the correct ohmmeter to use in hazardous areas
- List the correct ohmmeters and multimeters to use in non-hazardous areas
- Define the equipment inspection steps you must perform before using an ohmmeter or multimeter

Estimated completion time (hours): 0.7

Electrical Resistance Test Equipment

ELE-2021 The Fluke® Multimeter

Course Description

The Fluke multimeter is an electronic device used to test electrical circuits and to troubleshoot electronic components.

By the end of this course, you will be able to

- List the major components of the Fluke multimeter
- Explain how to prepare the Fluke multimeter for resistance testing
- Use the Fluke multimeter to test resistance

Estimated completion time (hours): 0.9

Electrical Resistance Test Equipment

ELE-2022 The Biddle® Ohmmeter

Course Description

The Biddle ohmmeter is an electronic device used to test electrical circuits and to troubleshoot electronic components.

By the end of this course, you will be able to

- List the major components of the Biddle ohmmeter
- Explain how to prepare the Biddle ohmmeter for resistance testing
- Use the Biddle ohmmeter to test resistance

Estimated completion time (hours): 0.8

Electrical Resistance Test Equipment

ELE-2023 The Avtron® Ohmmeter

Course Description

The Avtron ohmmeter is an electronic device used to test electrical circuits and to troubleshoot electronic components.

By the end of this course, you will be able to

- List the major components of the Avtron ohmmeter
- Explain how to prepare the Avtron ohmmeter for resistance testing
- Use the Avtron ohmmeter to test resistance

Estimated completion time (hours): 0.7

Electrical Resistance Test Equipment

ELE-2024 The Hewlett Packard® Milliohmmeter

Course Description

The Hewlett Packard milliohmmeter is an electronic device used to test electrical circuits and to troubleshoot electronic components.

By the end of this course, you will be able to

- List the major components of the Hewlett Packard milliohmmeter
- Explain how to prepare the Hewlett Packard milliohmmeter for resistance testing
- Use the Hewlett Packard milliohmmeter to test resistance

Estimated completion time (hours): 0.8

Electrical Resistance Test Equipment

ELE-2025 The BCD M1® Ohmmeter

Course Description

The BCD M1 ohmmeter is an electronic device used to test electrical circuits and to troubleshoot electronic components.

By the end of this course, you will be able to

- List the major components of the BCD M1 ohmmeter
- Explain how to prepare the BCD M1 ohmmeter for resistance testing
- Use the BCD M1 ohmmeter to test resistance

Estimated completion time (hours): 0.9

Crimping Terminals and Splices

ELE-4001 Terminals and Splices

Course Description

Wires in an airplane may need to be attached to the structure or the equipment, or they may need to be joined together. Special components called terminals are used to attach the wire. Splices are used to join wires.

By the end of this course, you will be able to

- List the parts of a terminal
- List the parts of a splice
- Understand the difference between butt and parallel splices
- Understand the meaning of restricted entry terminal
- Understand the meaning of multiple conductor terminal

Estimated completion time (hours): 1.0

Crimping Terminals and Splices

ELE-4002 Crimping

Course Description

Understanding how to attach a terminal or splice to wires is important for assembly electricians to correctly install wire bundles. It is also important that the assembly electrician selects the correct size terminal or splice for different sizes of wires.

By the end of this course, you will be able to

- Understand the measurement unit CAU
- Select terminal and splice sizes based on the CAU of wires
- List the parts of a terminal crimping tool
- Understand the importance of the location of a crimp

Estimated completion time (hours): 1.5

Crimping Terminals and Splices

ELE-4003 Crimping a Terminal

Course Description

Correctly installing wire bundles requires an understanding of how to attach a terminal or splice to wires.

By the end of this course, you will be able to

- Select the correct size terminal for the wires
- Determine the correct length to strip wires
- Select the correct crimping tool
- Determine the correct setting for the insulation crimping adjustment pin

Estimated completion time (hours): 1.3

Crimping Terminals and Splices

ELE-4004 Crimping a Pre-insulated Splice

Course Description

Knowing how to select a pre-insulated splice, prepare the wires, and crimp the splice onto the wires is critical to a successful electrical installation.

By the end of this course, you will be able to

- Select the correct size splice for the wires
- Determine the correct length to strip wires
- Select the correct crimping tool
- Determine the correct setting for the insulation crimping adjustment pin
- Calculate the size of additional material needed to build up a wire to meet the minimum CAU of a splice

Estimated completion time (hours): 1.6

Assembly of Coaxial Connectors

ELE-4005 Coaxial Cable

Course Description

Radio communication is critical to the safe operation of an airplane. Special cables called coax cables are often used to provide static-free radio communications.

By the end of this course, you will be able to

- List the parts of a coax cable
- List some types of coax cables
- Understand the history of coax cable

Estimated completion time (hours): 0.8

Assembly of Coaxial Connectors

ELE-4006 Coaxial Connectors

Course Description

Coax cables require special connectors to connect to the equipment. Knowledge of the required connection components is important for the installation of coax cables.

By the end of this course, you will be able to

- List the components required to connect a coax cable to equipment
- List methods to install contacts
- List the different types of mountings for coax cable connectors

Estimated completion time (hours): 1.0

Assembly of Coaxial Connectors

ELE-4007 Coaxial Connector Tools

Course Description

Coax cables and connectors require special tools for their assembly. Knowledge of these tools is important for the installation of coax cables and connectors.

By the end of this course, you will be able to

- List the tools required to install coax connectors on a cable
- List the parts of a coax stripping tool
- List the parts of an outer sleeve crimping tool
- List the parts of a contact crimping tool

Estimated completion time (hours): 1.3

Assembly of Coaxial Connectors

ELE-4008 Coaxial Connector Assembly

Course Description

This course allows you to prepare a coax cable, crimp a contact, and crimp a coaxial connector.

By the end of this course, you will be able to

- Determine the correct length to strip the sections on a coax cable
- Select the correct size connector
- Set the contact crimping tool to the correct settings

Estimated completion time (hours): 1.7

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ENGINEERING DRAWINGS SKILLS COURSES

Blueprint Reading Fundamentals

DWG-1001 Introduction to Blueprints

Course Description

A blueprint is the primary means of communicating the requirements of a product to all those involved in manufacturing or building the product. Understanding how to read and interpret a blueprint is a universal skill that is used in almost every industry.

By the end of this course, you will be able to

- Explain the purpose of blueprints
- List other terms used for blueprints
- Describe methods of creating an engineering drawing
- Explain the purpose and contents of a title block
- Explain the importance of standards for engineering drawings

Estimated completion time (hours): 1.7

Blueprint Reading Fundamentals

DWG-1002 Engineering Drawing Terminology

Course Description

Words and phrases you use in everyday conversation have different meanings when applied to reading an engineering drawing. In this course, you will learn the meanings of words and phrases as they apply to engineering drawings. You will also learn to recognize and identify lines, shapes, and angles used in engineering drawings.

By the end of this course, you will be able to

- List the basic shapes used in engineering drawings
- Identify types of lines shown on engineering drawings
- Identify the angle types seen on engineering drawings
- Explain the relationships that exist between two or more lines
- Explain the relationships that exist between two or more circles
- Explain the relationships between lines, circles, and angles

Estimated completion time (hours): 1.5

Blueprint Reading Fundamentals

DWG-1003 Engineering Drawing Views

Course Description

The key to reading an engineering drawing is understanding how to visually interpret product illustrations. In this course, you will learn how the views on an engineering drawing are arranged and how to draw a three-dimensional object on a two-dimensional surface.

By the end of this course, you will be able to

- Determine the number of views required to define an object
- Explain the difference between isometric and orthographic drawings
- Describe the “glass box” method of illustrating views on an engineering drawing
- Interpret engineering drawings when shown an object
- Explain how views are arranged in a multiview drawing
- Identify views on an engineering drawing
- Describe the purpose of a sectional view
- Describe the function of cutting planes
- Define how front views are selected

Estimated completion time (hours): 1.6

Blueprint Reading Fundamentals

DWG-1004 Engineering Drawing Lines

Course Description

There are many types of lines used to define the shape of an object on an engineering drawing. Each type has a specific function in the definition of the object.

By the end of this course, you will be able to

- Identify each type of line used in an engineering drawing
- Describe the function of three line types used in an engineering drawing: visible, hidden, and center
- Describe the function of line precedence
- Identify line types given an engineering drawing
- Interpret hidden features on an engineering drawing
- Interpret views from viewing planes

Estimated completion time (hours): 1.3

Blueprint Reading Fundamentals

DWG-1005 Dimensions and Tolerances

Course Description

Dimensions and tolerances are used to define the required distances between lines, planes, and points on an object.

By the end of this course, you will be able to

- Define a feature
- Define a feature of size
- Describe the function of dimensions and tolerances on an engineering drawing
- Describe, identify, and interpret linear dimensions
- Describe, identify, and interpret dimensions for circular features
- Describe, identify, and interpret dimensions for angular features
- Describe basic rules for dimensioning an engineering drawing
- Describe different features of holes and their symbols

Estimated completion time (hours): 2.1

Blueprints and Picture Sheets for Aerospace

DWG-1006 Aerospace Introduction to Blueprints

Course Description

Blueprints are the road map for transforming materials into finished products. Understanding how to read and interpret a blueprint is a universal skill that is used in almost every industry.

By the end of this course, you will be able to

- Explain the history of blueprints
- Define the language of blueprints
- List the types of blueprints
- Explain why blueprints are standardized

Estimated completion time (hours): 1.4

Blueprints and Picture Sheets for Aerospace

DWG-1007 Blueprint Terminology

Course Description

Some words and phrases you use in everyday conversation have different meanings when applied to blueprint reading. In this course, you will learn the meanings of words and phrases as they are used on blueprints.

By the end of this course, you will be able to

- List the basic shapes used on blueprints
- Identify line types used on blueprints
- Identify the angle types you will see on blueprints
- Explain the relationships that exist between two or more lines
- Explain the relationships that exist between two or more circles

Estimated completion time (hours): 1.4

Blueprints and Picture Sheets for Aerospace

DWG-1008 Blueprint Views

Course Description

The key to blueprint reading is understanding how to visually interpret product illustrations. In this course, you will learn how blueprints are drawn and how to see a three-dimensional object on a two-dimensional surface.

By the end of this course, you will be able to

- Explain how blueprints are drawn
- Explain the difference between perspective, isometric, and orthographic drawings
- Define each of the orthographic views on a blueprint
- Visualize three-dimensional objects drawn as two-dimensional objects

Estimated completion time (hours): 2.0

Blueprints and Picture Sheets for Aerospace

DWG-1009 Blueprint Lines

Course Description

The picture area of a blueprint is the engineer's answer to a design problem. The engineer puts the answer on a drawing using lines and symbols that are common to the industry. In this course, you will learn how to read and interpret the lines on a blueprint.

By the end of this course, you will be able to

- Identify each type of line used in a blueprint drawing
- Interpret a product based upon a line drawing
- Interpret hidden features on a blueprint drawing
- Identify other views of the product on the blueprint drawing

Estimated completion time (hours): 1.3

Blueprints and Picture Sheets for Aerospace

DWG-1010 Blueprint Dimensions and Tolerances

Course Description

Dimensions and tolerances are used to define the distances between lines, planes, and symbols on a blueprint. In this course, you will learn how dimensions and tolerances make it possible to mass produce products with extraordinary levels of consistency and accuracy.

By the end of this course, you will be able to

- Identify the different types of dimensions
- Identify the different types of tolerances
- Explain the purpose of dimension lines and extension lines
- Identify tolerancing methods
- Calculate tolerances

Estimated completion time (hours): 1.6

Blueprints and Picture Sheets for Aerospace

DWG-1011 Blueprint Symbols

Course Description

Blueprints have unique standardized symbols that are used to communicate additional information about the product. Recognizing these symbols and their meanings is the final step to effectively reading blueprints.

By the end of this course, you will be able to

- Define the product datum
- List the categories of blueprint symbols
- Identify the most common symbols used on blueprints
- Identify the type of fastener specified on a blueprint
- Locate product feature symbols on a product drawing

Estimated completion time (hours): 1.6

Advanced Blueprint Reading

DWG-2001 Geometric Dimensions and Tolerances

Course Description

Size dimensions can often restrict a feature more than is needed. When the shape or form of a feature is more important than its size, a geometric dimension and tolerance is typically used.

By the end of this course, you will be able to

- Define maximum and least material conditions
- List the five geometric characteristic categories
- Identify geometric characteristic symbols
- Define a datum and datum feature
- Describe, identify, and interpret dimensions for angular features
- Identify the sections of a feature control frame
- Describe where datum feature symbols are located on an engineering drawing

Estimated completion time (hours): 1.4

Advanced Blueprint Reading

DWG-2002 Assemblies and Fits

Course Description

The ability to read an assembly drawing and identify the components is important to many people working in manufacturing. It is also important to understand how dimensions and tolerances affect how easily the components should assemble or fit together.

By the end of this course, you will be able to

- List and describe two methods of displaying an assembly in an engineering drawing
- Interpret an assembly drawing
- Define the types of fits
- Determine the type of fit between two mating parts

Estimated completion time (hours): 1.0

Advanced Blueprint Reading

DWG-2003 Threads and Fasteners

Course Description

Threaded fasteners are frequently used in assemblies. Understanding the terms associated with threads and threaded fasteners is important for anyone working with fasteners and other parts with threads.

By the end of this course, you will be able to

- Describe the function of a threaded fastener
- Identify the basic characteristics of a thread
- Describe how to specify threaded fasteners
- Identify the size and type of fastener given an example
- Define the grades of bolts
- Identify the grade of a bolt

Estimated completion time (hours): 1.3

Aerospace Wire Installation Drawings

DWG-2004 Engineering Drawing Review

Course Description

Engineering drawings are used in almost every industry. Understanding how to read and interpret an engineering drawing is a valuable skill.

By the end of this course, you will be able to

- List the main areas of an engineering drawing
- Define the different engineering drawing views
- Understand the difference between an orthographic projection drawing and an isometric drawing

Estimated completion time (hours): 0.9

Aerospace Wire Installation Drawings

DWG-2005 Wire Bundle Installation Paperwork

Course Description

There are a number of engineering documents needed for a wire bundle installation.

By the end of this course, you will be able to

- Identify a course
- Understand the course numbering system
- Identify a course parts list
- Read and interpret a course parts list
- Recognize the different sections of an installation plan
- Understand how to use an installation plan on a shop floor
- Understand the function of the Airplane Specific Configuration Table

Estimated completion time (hours): 1.1

Aerospace Wire Installation Drawings

DWG-2006 Electrical Production Illustrations

Course Description

Electrical production illustration drawings are a visual representation of the electrical wiring path in an airplane.

By the end of this course, you will be able to

- Recognize several different types of engineering drawings, including
 - Electrical Area Breakdown Drawings
 - General Notes Drawings
 - Electrical Production Installation Drawings
- List the sections of an electrical production illustration drawing
- Understand what the symbols found on production illustration drawings represent
- Understand the purpose of the tables found on an electrical production illustration drawing picture sheet
- Read an electrical production illustration drawing

Estimated completion time (hours): 1.4

Composite Engineering Drawings and Instructions

DWG-2007 Engineering Communication

Course Description

Manufacturing a product requires a great amount of communication among all the people involved. Much of the communication must come from engineers. Engineers use a variety of methods to communicate this required information.

By the end of this course, you will be able to

- List methods engineers use to communicate design requirements
- List methods engineers use to communicate manufacturing requirements

Estimated completion time (hours): 1.5

Composite Engineering Drawings and Instructions

DWG-2008 Composite Engineering Drawings

Course Description

Understanding the information contained on an engineering drawing for a composite product is critical to successfully manufacturing the product. In this course, you'll learn how to decipher this information.

By the end of this course, you will be able to

- Identify common components of an engineering drawing for composite parts
- Distinguish between flag notes and general notes
- Identify the information found in ply tables
- Identify the information in splice control tables

Estimated completion time (hours): 1.1

Composite Engineering Drawings and Instructions

DWG-2009 Work Instructions

Course Description

In composite manufacturing, work instructions are used extensively for kitting, completing layups, curing, and machining or trimming. Work instructions enable you to produce a quality composite part.

By the end of this course, you will be able to

- Relate work instructions to an engineering drawing
- Understand why work instructions are needed to provide necessary information

Estimated completion time (hours): 1.1

Geometric Dimensioning and Tolerancing

DWG-3001 Introduction to GD&T

Course Description

Engineering detail drawings communicate design intent along the entire supply and production line to ensure that mechanical parts meet a desired form, fit, and function.

By the end of this course, you will be able to

- Understand the history of the Y14.5 standard
- Define the purpose of an engineering detail drawing
- Define the terms dimension, tolerance, and geometric tolerance

Estimated completion time (hours): 0.9

Geometric Dimensioning and Tole

DWG-3002 GD&T Terms and Symbols

Course Description

There are many terms and symbols unique to engineering drawings. Understanding these terms and symbols is important in understanding the design intent of the part represented on the drawing.

By the end of this course, you will be able to

- Understand how different units of measure are represented on engineering drawings
- Define the symbols used on engineering drawings
- Identify the components of a dimension
- List locations of dimensions
- Define a reference dimension
- Define a basic dimension

Estimated completion time (hours): 1.5

Geometric Dimensioning and Tolerancing

DWG-3003 Rules of GD&T

Course Description

ASME Y14.5 requires engineering drawings to be created and interpreted to a set of rules. Understanding these rules is important to understanding the design intent of a part.

By the end of this course, you will be able to

- Understand Rule #1 of GD&T
- List tolerance zone shapes
- Define size
- Define the local size of a feature of size
- Define actual mating size
- Understand the implied 90-degree rule
- Understand how to apply general, or block, tolerances

Estimated completion time (hours): 2.0

Geometric Dimensioning and Tolerancing

DWG-3004 Geometric Tolerances

Course Description

Engineers use geometric tolerances to convey the design intent of the form or location of features when size tolerances may be too restrictive.

By the end of this course, you will be able to

- List the geometric characteristics controlled by geometric tolerances
- Identify the symbols used in geometric tolerances
- Identify a feature control frame
- Identify the tolerance area of a feature control frame
- Identify the geometric characteristic area of a feature control frame
- Identify the datum references area of a feature control frame
- Identify a basic dimension

Estimated completion time (hours): 1.6

Geometric Dimensioning and Tolerancing

DWG-3005 Datums

Course Description

Datums are the foundation that provides a method of aligning geometric tolerance zones to ensure features meet their intended design.

By the end of this course, you will be able to

- Define a datum
- Define a datum feature
- Identify a datum feature symbol
- Define a simulated datum
- Define a datum reference frame
- Identify a datum target symbol
- Understand the importance of the order of precedence of datums

Estimated completion time (hours): 1.4

Geometric Dimensioning and Tolerancing

DWG-3006 Form Tolerances

Course Description

Form geometric tolerances are used frequently to control shapes of individual features of parts. Understanding the tolerance zone created by a form geometric tolerance is important for anyone involved in manufacturing.

By the end of this course, you will be able to

- Identify a tolerance zone for a straightness geometric tolerance
- Identify a tolerance zone for a circularity geometric tolerance
- Identify a tolerance zone for a cylindrical geometric tolerance
- Identify a tolerance zone for a flatness geometric tolerance

Estimated completion time (hours): 1.0

Geometric Dimensioning and Tolerancing

DWG-3007 Profile Tolerances

Course Description

Profile geometric tolerances are used to define the limits of contours of lines and surfaces containing straight lines, arcs, partial cylinders, and even mathematically defined curves.

By the end of this course, you will be able to

- Define a tolerance zone for a profile of a line
- Define a tolerance zone for the profile of a surface
- Understand unilateral profile tolerancing
- Understand bilateral profile tolerancing

Estimated completion time (hours): 0.9

Geometric Dimensioning and Tolerancing

DWG-3008 Orientation Tolerances

Course Description

Orientation tolerances control the alignment of features to datum features. Orientation tolerances control the angularity, parallelism, and perpendicularity of features.

By the end of this course, you will be able to

- Define the tolerance zones for the perpendicularity of a plane or axis
- Define the tolerance zones for the angularity of a plane or axis
- Define the tolerance zone for the parallelism of planes or an axis
- Understand the application of the qualifying notation: "EACH RADIAL ELEMENT"
- Understand the application of a projected tolerance zone
- Understand the characteristic of a thread, or gear, to which a geometric tolerance applies

Estimated completion time (hours): 1.2

Geometric Dimensioning and Tolerancing

DWG-3009 Runout Tolerances

Course Description

Runout tolerances are applied to features of rotating parts. These tolerances reduce vibration and uneven wear of the features to which the tolerance is applied.

By the end of this course, you will be able to

- Define a tolerance zone for a circular runout tolerance
- Define a tolerance zone for a total runout tolerance
- Understand the difference between circular runout and total runout tolerances
- Understand the terms full indicator movement and total indicated reading

Estimated completion time (hours): 0.8

Geometric Dimensioning and Tolerancing

DWG-3010 Location Tolerances

Course Description

Geometric tolerances control the position of axes, center planes, surfaces, and midpoints of features to datum features.

By the end of this course, you will be able to

- List the three geometric tolerances for location
- Define the tolerance zone for concentricity
- Define the tolerance zone for symmetry
- Define the tolerance zone for the position of a feature at RFS
- Define the tolerance zone for the position of a feature at MMC

Estimated completion time (hours): 1.2

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FASTENERS SKILLS COURSES

Fasteners

FAS-2001 Temporary Fasteners

Course Description

Temporary fasteners are used to hold materials together until permanent fasteners are installed. Temporary fasteners ensure that all of your drilled holes and fasteners will meet the engineering specifications.

By the end of this course, you will be able to

- Identify different types of temporary fasteners
- Determine how temporary fastener sizes are identified
- Understand why temporary fasteners are used
- Explain how to install Cleco clamps
- Explain how to install the different kinds of Cleco fasteners

Estimated completion time (hours): 0.8

Fasteners

FAS-2002 Rivets

Course Description

Rivets are permanent mechanical fasteners used in airplane construction to hold two or more pieces of material together. Understanding how rivets work will enable you to install them properly.

By the end of this course, you will be able to

- Name two types of rivets used in aviation
- List the parts of a solid shank rivet
- Describe how solid shank rivets work
- Describe common solid shank rivet defects
- Describe how fluid-tight rivets are installed
- Explain how a rivet shaver is used

Estimated completion time (hours): 1.3

Fasteners

FAS-2003 Bolts, Screws, and Washers

Course Description

Bolts, screws, and washers are used to fasten two or more components together. Understanding how these fasteners work will enable you to install them properly.

By the end of this course, you will be able to

- Name the types of bolts used in aviation
- List the parts of a bolt
- Describe how these bolts work
- Explain how bolts are identified
- List the parts of a screw
- Describe different types of washers and their uses

Estimated completion time (hours): 0.9

Fasteners

FAS-2004 Threaded Inserts

Course Description

A threaded insert is a device used to replace damaged internal threads or to provide greater holding strength for a thread in weak materials.

By the end of this course, you will be able to

- List the two threaded insert designs
- List different locking mechanisms on threaded inserts
- Understand the process of installing a threaded insert

Estimated completion time (hours): 2.0

Fasteners

FAS-2005 Hi-Loks

Course Description

Hi-Loks are permanent threaded fasteners that combine the best features of a rivet and a bolt. Their high strength-to-weight ratio makes Hi-Lok fasteners an excellent choice for many areas of the aircraft structure.

By the end of this course, you will be able to

- Explain the benefits of a Hi-Lok fastener
- Identify and explain the major components of a Hi-Lok
- Explain the process of selecting the proper Hi-Lok
- Install a Hi-Lok fastener

Estimated completion time (hours): 0.9

Fasteners

FAS-2006 Lockbolts

Course Description

Lockbolts are permanent threaded fasteners that combine the best features of a rivet and a bolt. Their high strength-to-weight ratio makes the lockbolt fastener an excellent choice for many areas of the aircraft structure.

By the end of this course, you will be able to

- Explain the benefits of a lockbolt fastener
- Identify and explain the major components of a lockbolt
- Explain the process of selecting the proper lockbolt
- Install a lockbolt fastener

Estimated completion time (hours): 1.0

Fasteners

FAS-2007 Nut Plates

Course Description

This course introduces you to nut plates, which are fasteners used to secure bolts on panels or other items that are frequently removed.

By the end of this course, you will be able to

- List the different types of nut plates
- Understand the function of a nut plate
- List the tools needed to install a nut plate

Estimated completion time (hours): 0.7

Fasteners

FAS-2008 Blind Rivets

Course Description

Blind rivets are permanent mechanical fasteners that are installed from one side of the workpiece. They are used to hold two or more pieces of material together. Understanding how blind rivets work will enable you to install them properly.

By the end of this course, you will be able to

- List the components of a blind rivet
- Describe how a blind rivet works
- List the components of a mechanical-lock blind fastener
- Describe how a mechanical-lock blind fastener works

Estimated completion time (hours): 0.7

Fasteners

FAS-2009 Identifying Fasteners

Course Description

Aircraft fasteners come in many styles and sizes. Standard identification codes are used to identify the fasteners used in the aviation industry.

By the end of this course, you will be able to

- Recognize the identification standards used in fastener codes
- Recognize the codes that identify fasteners
- Understand the more common materials that fasteners are made of
- Identify the information in the National Aerospace Standard Code cross symbol

Estimated completion time (hours): 1.1

Fasteners

FAS-2010 Fasteners and Fits

Course Description

Fasteners and their mating parts are meant to join together in a particular way called a fit. How they fit together is very important to the structural stability of an aircraft.

By the end of this course, you will be able to

- Define the term fit in relation to fasteners and parts of an assembly
- List the different types of fits
- Understand the relationships between fasteners and their mating parts
- Understand how fastener fits are selected

Estimated completion time (hours): 1.0

Fasteners

FAS-2011 Securing and Lockwiring Fasteners

Course Description

Torsion, tension, and the vibrations that occur during normal flight may cause some types of fasteners used in airplane assembly to loosen. These fasteners must be secured so that they remain in place.

By the end of this course, you will be able to

- Understand why bolts are secured
- Describe the ways bolts are secured
- Recognize a pair of lockwire pliers
- Recognize castellated nuts and cotter pins
- Understand how to use a cotter pin with a castellated nut

Estimated completion time (hours): 1.1

Fasteners

FAS-2012 Torque Tools

Course Description

Torque is the force that rotates an object around an axis. Torque tools, commonly called torque wrenches, apply this force to nuts and bolts used in airplane assembly.

By the end of this course, you will be able to

- Define torque
- Identify the different types of torque tools
- Understand how torque is measured
- Convert between the different units used to measure torque

Estimated completion time (hours): 1.0

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HAND TOOLS SKILLS COURSES

HAN-2001 Files, Hand Reamers, and Lapping Tools

Course Description

Files, hand reamers, and lapping tools are used to shape materials. The shapes created with these tools include flat surfaces, curved surfaces, and precision holes. Each tool requires knowledge of the tool and its use to make products that meet the requirements of an engineering drawing.

By the end of this course, you will be able to

- Explain the purpose and function of a file
- Identify the major components of a file
- List the most common types of files
- Define and describe the purpose of a hand reamer
- Discuss the use of an adjustable hand reamer
- Define and describe the purpose of a lapping tool
- Describe the purpose of lapping compounds

Estimated completion time (hours): 1.2

HAN-2002 Hammers, Punches, and Chisels

Course Description

When creating tooling, a toolmaker must sometimes assemble component parts. When doing this, the toolmaker will often use hammers, punches, and chisels of various types.

By the end of this course, you will be able to

- Describe the purpose and function of a hammer
- Identify the different types of hammers commonly used in tool making
- Describe the purpose and function of a mallet
- Identify the different types of mallets commonly used in tool making
- Describe the purpose and function of a punch
- List the types of punches commonly used in tool making
- Describe the purpose and function of a chisel
- Identify the different types of chisels commonly used in tool making

Estimated completion time (hours): 0.9

HAN-2003 Pliers and Ratchets

Course Description

When creating fixtures, jigs, and other tooling, toolmakers use a variety of pliers and ratchets. These tools are used to secure, hold, or assemble work pieces either permanently or temporarily.

By the end of this course, you will be able to

- Describe the use of pliers
- List the types of pliers commonly used by toolmakers
- Describe the use of a ratchet wrench
- State the method for switching between tightening and loosening on a ratchet wrench

Estimated completion time (hours): 0.8

HAN-2004 Scribes, Optical Center Finders, and Drill Blocks

Course Description

An important part of creating tooling is defining patterns and the locations of holes for cutting and drilling. Toolmakers use optical center finders and scribes in combination with templates when laying out tooling and drill blocks to ensure holes are drilled correctly.

By the end of this course, you will be able to

- State the purpose of layout dye
- Describe how layout dye is removed after machining
- Explain the use of scribing tools
- Describe the purpose of an optical center finder
- Describe the purpose of a drill block

Estimated completion time (hours): 0.8

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HYDRAULICS SKILLS COURSES

Introduction to Hydraulics

HYD-1001 Introduction to Hydraulics

Course Description

A hydraulic system uses liquid to transmit power. It is designed to create the energy required in the fluid to make the entire system operate.

By the end of this course, you will be able to

- Understand fluid power
- Define hydraulics
- Describe the differences between hydrostatic and hydrodynamic systems
- List the advantages of a fluid power system
- Identify the basic components of a fluid power system
- Compare a hydraulic and pneumatic system
- Compare four different types of power systems

Estimated completion time (hours): 1.1

Introduction to Hydraulics

HYD-1002 Hydraulic Theory

Course Description

Hydraulics is based on physics. As a result, it's crucial that you understand the theoretical concepts and fundamental laws applicable to hydraulics. Parameters to control include force, speed, acceleration, path, flow rate, and pressure. In addition, you need to understand the fundamental laws of hydraulics, such as the continuity equation, energy equation, and pressure losses due to friction.

By the end of this course, you will be able to

- Analyze and discuss the theoretical concepts applicable to hydraulics
- Summarize parameters and their units
- Understand the fundamental laws of hydraulics

Estimated completion time (hours): 1.3

Introduction to Hydraulics

HYD-1003 Hydraulic Fluids

Course Description

Hydraulic fluid plays an important role in a hydraulic system. Without hydraulic fluid, the service life of other components would be much shorter.

By the end of this course, you will be able to

- Identify the functions of hydraulic fluids
- Understand the different types of hydraulic fluids
- Describe the different classifications of hydraulic oils and flame-retardant liquids
- Know how to select hydraulic oils based on characteristics and purpose
- Understand the importance of periodically checking hydraulic fluids

Estimated completion time (hours): 0.9

Introduction to Hydraulics

HYD-1004 Hydraulic Systems

Course Description

Hydraulic systems use fluid power to perform work. A simple hydraulic system consists of several common components, including a tank, pump, filter, heat exchanger, accumulator, valve, and actuator.

By the end of this course, you will be able to

- Understand the purpose of a hydraulic system
- Identify the major components of a simple hydraulic system
- Describe the purpose of a hydraulic tank
- Identify the components of a hydraulic tank
- Describe the purpose of a hydraulic pump
- Understand how a hydraulic pump works
- Describe the purpose of a hydraulic filter
- Understand how a hydraulic filter works
- Describe the purpose of a heat exchanger
- Understand how a heat exchanger works
- Explain the purpose of a hydraulic accumulator
- Understand how a hydraulic accumulator works

Estimated completion time (hours): 1.4

Components of a Hydraulics System

HYD-2001 Hydraulic Actuators

Course Description

An actuator transforms hydraulic energy into mechanical energy so that work can be performed. An actuator may be in the form of a cylinder or motor.

By the end of this course, you will be able to

- Explain the purpose of a hydraulic actuator
- Identify the different types of cylinders
- Describe the components of a cylinder actuator
- List the applications of hydraulic motors
- Recognize the importance of hydraulic motor maintenance

Estimated completion time (hours): 1.1

Components of a Hydraulics System

HYD-2002 Classification of Hydraulic Valves

Course Description

A hydraulic valve regulates and controls the hydraulic system's fluid. Valves are classified based on the power to be transmitted, their function, the control, and their design. In this chapter, you'll learn about the different classifications of hydraulic valves.

By the end of this course, you will be able to

- Describe the purpose of a hydraulic valve
- Understand how a hydraulic valve works
- List the different classifications of hydraulic valves
- Describe the different types of pressure valves
- Understand the use of directional valves
- Describe classifications of shut-off valves
- Understand the different types of flow valves
- Describe on/off valves
- List the different types of proportional valves
- Describe the features of proportional control valves
- Describe the function of servo valves
- List the advantages and applications of cartridge valves
- Describe the main uses of logic valves

Estimated completion time (hours): 2.2

Components of a Hydraulics System

HYD-2003 Hydraulic Piping and Instrumentation

Course Description

Piping and tubing transport hydraulic energy throughout the circuit of a hydraulic system. This piping may be flexible or rigid. When flexible or rigid piping aren't the best solution, connection blocks may be used. In addition, several types of instruments measure pressure and flow in hydraulic circuits.

By the end of this course, you will be able to

- Understand the use of piping and tubing
- Describe the features of flexible and rigid piping
- Recognize the difference between fittings and one-touch fittings
- List the two connection types of rigid piping
- Understand the use of connection blocks
- List the types of pressure measuring instruments
- Describe how a pressure gauge works
- Understand the functions of a pressure switch and pressure transducer
- List the types of flow measuring instruments
- Identify what a multimeter can measure

Estimated completion time (hours): 1.0

Components of a Hydraulics System

HYD-2004 Hydroelectric Symbology and Circuits

Course Description

In this course, you'll discover the symbols used in hydraulic systems. You'll also learn about basic hydraulic and electrohydraulic circuits and their applications.

By the end of this course, you will be able to

- Identify basic symbols
- Identify the symbols of the elements for a hydraulic group
- Identify hydraulic pump symbols
- Identify hydraulic actuator symbols
- Identify hydraulic valve symbols
- Identify basic hydraulic and electrohydraulic circuits and their applications

Estimated completion time (hours): 1.5

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LOGISTICS SKILLS COURSES

Introduction to Logistics

LOG-1001 What is Logistics?

Course Description

Have you ever thought about the journey your smart phone took from the manufacturer to your hands? After it was manufactured, it then it went through a detailed logistics process. Let me just say that logistics is *way* more than just transportation! It's a complex system that's essential to the manufacturing process.

By the end of this course, you will be able to

- Define logistics
- Identify key accomplishments in the history of logistics
- Identify the main types of logistics
- Describe the fundamental tasks associated with logistics
- List the top logistics companies in Indiana

Estimated completion time (hours): 0.9

Introduction to Logistics

LOG-1002 Logistics Technology

Course Description

Today, technology and logistics are deeply intertwined. Updated IT systems ensure the flow of products and data. Trade and product sales would sink without the right technology. In this course you will take a closer to look at a few important processes for supply chain management and material handling, as well as the technology needed for those processes.

By the end of this course, you will be able to

- Differentiate among the various technologies that enable and support supply chain management
- Identify the main categories associated with material handling
- Differentiate among the various technologies that enable and support material handling

Estimated completion time (hours): 0.8

Introduction to Logistics

LOG-1003 Inventory

Course Description

Inventory is the result of tons of planning and processes. Too much inventory is always bad for the company. In this course you will discover the real meaning of inventory.

By the end of this course, you will be able to

- Describe what inventory is and its importance
- Define lead time and its effect on inventory
- Determine the appropriate amount of inventory needed based on the situation
- Define Just-In-Time inventory
- Differentiate among the three types of inventory costs
- Describe how inventory management works
- Identify different types of inventory packaging

Estimated completion time (hours): 0.8

Introduction to Logistics

LOG-1004 Distribution and Transportation

Course Description

When you think about logistics, you think about moving. This course focuses on some great strategies for getting finished products from one point to another, whether it's a retail store or the customer.

By the end of this course, you will be able to

- Define product distribution and describe its importance
- Define warehousing and describe its role in supply chain management
- Identify steps involved in order processing
- Define material handling systems and describe how they function
- Identify different modes for transporting goods

Estimated completion time (hours): 0.9

Introduction to Logistics

LOG-1005 Safety, Quality and the Environment in Logistics

Course Description

There are three things you must be aware of in the world of logistics: safety, quality and the environment. Companies must develop programs and policies to make sure that no one gets hurt and that they are taking measures to avoid damaging the environment. They do this while working to make sure that their products are successfully handled and distributed.

By the end of this course, you will be able to

- Describe the importance of safety and safety education in logistics
- Define quality as it relates to logistics
- Describe and define "green logistics"

Estimated completion time (hours): 0.7

Introduction to Logistics

LOG-1006 Winning in Logistics

Course Description

Do you think you've got what it takes to be a winner in logistics? To make sure products are transported safely from the manufacturer's door to the customer's door? It takes many great minds to put together a winning logistics plan. A win in logistics means a win for the company and a win for customers who use the products.

By the end of this course, you will be able to

- List the main elements that can help a logistics company "win"
- Understand how costs help determine a logistics company's success
- Recognize logistics teamwork strategies
- Explain how delivery, safety, environment and customers influence success

Estimated completion time (hours): 0.8

Introduction to Logistics

LOG-1007 Careers in Logistics

Course Description

The world of logistics is like its own ecosystem. Teams, roles and processes are tightly connected and dependent upon one another within companies and industries.

By the end of this course, you will be able to

- Identify teams that work together in the logistics world
- Articulate the overall mission of a team
- Describe various roles and responsibilities within logistics teams
- Describe how teams and individuals work together to prepare products for delivery

Estimated completion time (hours): 0.9

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**MANUFACTURING SKILLS
COURSES**

Introduction to Manufacturing

MFG-1001 What is Advanced Manufacturing?

Course Description

Many people think of “manufacturing” as mindlessly putting together widgets. But advanced manufacturing is at the heart of our modern culture. It offers so many opportunities for creative thinkers, problem-solvers, project leaders, people who enjoy working with the latest technologies and those who like to work with their hands.

By the end of this course, you will be able to

- Define advanced manufacturing
- Identify things you use in your life that are manufactured
- List the top manufacturing industries in the United States
- List the top manufacturing industries in Indiana

Estimated completion time (hours): 0.9

Introduction to Manufacturing

MFG-1002 Manufacturing History and Technology

Course Description

Today's advanced manufacturing companies seek out and use cutting-edge technologies and machines. They embrace environmental practices. And there's a bigger focus on creating products for a global market. Imagine how you could make a difference with an exciting career in advanced manufacturing.

By the end of this course, you will be able to

- Explain events that influenced manufacturing throughout history
- List software technologies designed to help in the manufacturing process
- List manufacturing hardware that is used in modern advanced manufacturing
- Describe how connectivity on the macro and micro levels affects advanced manufacturing

Estimated completion time (hours): 1.0

Introduction to Manufacturing

MFG-1003 From Ideas to Products

Course Description

Have you ever thought about how ideas become products? In this course you will learn about the process of taking great ideas and transforming them into amazing products that people want to use.

By the end of this course, you will be able to

- Describe how manufacturing helps transform ideas into products
- Identify different manufacturing roles and how they play a part in product development
- Identify ways technology can help in the product development process

Estimated completion time (hours): 0.9

Introduction to Manufacturing

MFG-1004 From Design to Manufacturing

Course Description

In this course, you will learn what it takes to design and get an advanced manufacturing facility up and running for a new product launch.

By the end of this course, you will be able to

- Describe the process for planning an advanced manufacturing facility
- Identify different advanced manufacturing teams and their questions and concerns in creating a new facility
- Recognize the next steps after the plan has been finalized

Estimated completion time (hours): 1.1

Introduction to Manufacturing

MFG-1005 Safety, Quality and the Environment in Manufacturing

Course Description

If you were involved in the world of advanced manufacturing, there are three things you're constantly thinking about: safety, quality and the environment. What do you think these words mean in terms of manufacturing? In advanced manufacturing, companies always think ahead when it comes to safety, quality and the environment.

By the end of this course, you will be able to

- Describe the importance of safety and safety education in manufacturing
- Define “quality” as it relates to manufacturing
- Describe and define "green manufacturing”

Estimated completion time (hours): 0.7

Introduction to Manufacturing

MFG-1006 Measuring Success in Manufacturing

Course Description

Advanced manufacturing is unique in that you can experience the pride and satisfaction that comes with winning more often than you would working in a different field. What's cool about advanced manufacturing is that when you get a win, you're making a difference for the company, but you're also making a huge difference for yourself and for the world.

By the end of this course, you will be able to

- List the main elements that can help a manufacturing company "win"
- Understand how costs—including target cost and cost of production—help determine an advanced manufacturing company's success
- Use math to determine the efficiency and productivity of a manufacturing cycle or equipment
- Explain how delivery, safety, environment and customers influence success

Estimated completion time (hours): 0.9

Introduction to Manufacturing

MFG-1007 Careers in Manufacturing

Course Description

The world of advanced manufacturing is like its own ecosystem. Teams, roles and processes are tightly connected and dependent upon one another within companies and industries. This course looks at the different teams and roles in more detail.

By the end of this course, you will be able to

- Identify teams that work together in the advanced manufacturing world
- Articulate the overall mission of a team
- Describe various roles and responsibilities within advanced manufacturing teams
- Describe how teams and individuals work together to manufacture quality products

Estimated completion time (hours): 1.1

Manufacturing and Logistics Game

MFG-1008 The Game of Manufacturing and Logistics

Course Description

Have you ever thought about what it takes to not only design, but also produce, program, test and deliver an electronic device? And to make sure that product is a profitable success! This game-based course lets you design and deliver a new product while trying to maintain costs and deliver the product on time.

By the end of this course, you will be able to

- Design an electronic device
- Produce an electronic device
- Program an electronic device
- Test an electronic device
- Deliver an electronic device
- Take a product to market

Estimated completion time (hours): 0.6

Engineering Processes

MFG-1009 The Engineering Process

Course Description

Creating a new product, whether it's something as small as a pen or something as large as an airplane, doesn't just happen. It takes a lot of hard work and creative thinking.

By the end of this course, you will be able to

- List the phases in the engineering process
- Understand the function of each stage in the engineering process

Estimated completion time (hours): 0.8

Engineering Processes

MFG-1010 Information Sharing

Course Description

Computer document storage systems enable global access to critical documents and engineering information. Sharing information electronically ensures that everyone in the company has the latest and most accurate information when and where they need it.

By the end of this course, you will be able to

- Describe why it is important to share information
- Understand why electronic information sharing systems are used
- Describe the different types of information stored electronically
- Explain how document storage will impact you in your job

Estimated completion time (hours): 0.8

Manufacturing Paperwork

MFG-1011 Airplane Regulations

Course Description

The aerospace industry is a regulated industry. These regulations explain why airplane manufacturers need to keep documentation of how and when airplanes are made and the types of information they must contain.

By the end of this course, you will be able to

- Identify the federal agency charged with regulating the aviation industry
- Understand the role of paperwork in regulating the aviation industry
- List the different levels of paperwork
- Recognize the types of paperwork you will see on the assembly floor
- Understand why completing paperwork is important

Estimated completion time (hours): 0.9

Manufacturing Paperwork

MFG-1012 The Production Order

Course Description

The production order is a document with instructions on how to produce detail parts and assemblies according to engineering.

By the end of this course, you will be able to

- Understand the purpose of a production order
- Identify the people responsible for creating the production order
- Describe the information you can find in a production order
- Understand how to use the production order
- Understand why following all the steps in a production order is important

Estimated completion time (hours): 1.0

Manufacturing Paperwork

MFG-1013 The Installation Plan

Course Description

The installation plan is the authorization document that allows the assembly of an airplane. The installation plan contains everything you need to complete the assembly.

By the end of this course, you will be able to

- Understand the purpose of an installation plan
- List the sections of an installation plan
- Describe the information you can find in each section of the installation plan
- Understand why following all the steps in an installation plan is important

Estimated completion time (hours): 0.9

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MATERIALS SKILLS COURSES

Metals and Materials

MAT-2001 Introduction to Metals

Course Description

Metal products are used in every industry, including construction, transportation, electronics, manufacturing, medical devices, and consumer products. It is important to understand the properties of metals when designing products and choosing manufacturing processes.

By the end of this course, you will be able to

- Identify metal products
- Recognize a periodic table and the metals, nonmetals, and metalloids classifications
- Define metals, nonmetals, and metalloids
- Describe and compare the properties of metals, nonmetals, and metalloids
- Explain that metal, nonmetal, and metalloid elements can be combined to form metal alloys
- Explain why machinability is important
- Describe the mechanical properties of metals, including strength, toughness, ductility, malleability, brittleness, and hardness
- Identify and compare methods of testing hardness
- Describe and compare how metal parts are formed and how mechanical properties affect metal forming

Estimated completion time (hours): 1.1

Metals and Materials

MAT-2002 Ferrous Metals

Course Description

Irons, steels, and their alloys make up the family of ferrous metals. Ferrous metals are the most widely used metals in the world.

By the end of this course, you will be able to

- Define ferrous metals
- Compare the composition, properties, and uses of cast, wrought, and pig iron
- Compare the composition, properties, and uses of plain carbon, alloy, stainless, and tool steels
- Identify some of the elements used in iron and steel alloys and the properties they enhance

Estimated completion time (hours): 0.9

Metals and Materials

MAT-2003 Nonferrous Metals

Course Description

Nonferrous metals include metal elements that are not iron and alloys that do not have iron as their base metal. Some important and widely used nonferrous metal alloys have base elements of aluminum, titanium, copper, magnesium, and nickel.

By the end of this course, you will be able to

- Define nonferrous metals
- Compare the composition, properties, and uses of aluminum, titanium, copper, magnesium, and nickel alloys
- Identify some of the additional alloying elements used in nonferrous metals and the properties they enhance
- Identify common uses of nonferrous metals

Estimated completion time (hours): 0.8

Metals and Materials

MAT-2004 Heat Treatment of Metals

Course Description

Heat treatment involves the controlled heating and cooling of a metal to obtain desirable

changes in its mechanical properties. It can be used to increase the machinability and performance of metals.

By the end of this course, you will be able to

- Define heat treatment of metals
- Define quenching
- Describe and compare annealing, normalizing, and tempering
- Compare different methods of hardening metals
- Identify which heat treatment methods can be used on various steels and steel alloys

Estimated completion time (hours): 1.1

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MEASUREMENT SKILLS COURSES

Precision Measurements Tools

MEA-2001 Introduction to Precision Instruments

Course Description

Precision measurement instruments differ from normal measurement tools because of their ability to measure with a greater degree of precision and accuracy. To properly interpret these measurements, you must understand terms that are associated with these instruments.

By the end of this course, you will be able to

- Explain the difference between precision and accuracy
- Identify the resolution of a precision instrument
- Determine the discrimination of a precision instrument
- Identify the basic components of a measurement

Estimated completion time (hours): 1.1

Precision Measurements Tools

MEA-2002 Rules

Course Description

Rules are measurement tools used to measure distance and draw straight lines. Rules are used in many manufacturing, construction, and medical processes. In this course, you will gain the mastery required to accurately measure with a rule.

By the end of this course, you will be able to

- Identify the key components of the precision rule
- Interpret a rule's graduation lines
- Identify rules based upon their measurement scale
- Choose which type of precision rule to use to measure a length
- Use the precision rule to accurately measure a length

Estimated completion time (hours): 1.1

Precision Measurements Tools

MEA-2003 Calipers

Course Description

Calipers are measurement tools that are designed to measure distance, length, and depth. They are used in many professions, including manufacturing, woodworking, and health care. In this course, you will gain the mastery required to accurately measure with calipers.

By the end of this course, you will be able to

- Identify all of the parts of a caliper
- Describe how the parts work together to measure
- Interpret the graduation scales on the caliper
- Zero set your caliper
- Use the caliper to measure a length and depth
- Properly care for your caliper

Estimated completion time (hours): 1.3

Precision Measurements Tools

MEA-2004 Micrometers

Course Description

The micrometer is a precision measurement tool used to measure small lengths and distances. Micrometers are one of the most common measurement tools used in almost every manufacturing industry in the world. In this course, you will gain the mastery required to accurately measure products with a micrometer.

By the end of this course, you will be able to

- Identify the parts of a micrometer
- Describe how the parts work together to measure a product
- Interpret the graduation scales on the standard and Vernier micrometer
- Use the micrometer to accurately measure a distance
- Properly care for your micrometer

Estimated completion time (hours): 1.9

Precision Measurements Tools

MEA-2005 Small Hole Gauges

Course Description

A small hole gauge is a precision measurement tool that is ideal for measuring small holes, slots, and recesses in all kinds of work. The small hole gauge is used in aviation to inspect close tolerance holes, such as rivet holes and holes for Hi-Lok fasteners. In this course, you will gain the mastery required to accurately measure with a small hole gauge.

By the end of this course, you will be able to

- Identify all of the parts of a small hole gauge
- Describe how the parts work together to measure
- Use the small hole gauge to accurately measure a diameter and width
- Properly care for your small hole gauge

Estimated completion time (hours): 0.8

Precision Measurements Tools

MEA-2006 Dial Indicators

Course Description

Dial indicators are precision measurement tools that are used to measure small variations in a measurement distance. Dial indicators measure distances that are impossible to see with the naked eye. In this course, you will gain the mastery required to accurately measure with a dial indicator.

By the end of this course, you will be able to

- Explain the purpose of a dial indicator
- Differentiate between a balanced and a long-range of dial indicator
- List the major components of a dial indicator
- Explain how to perform a measurement with a dial indicator

Estimated completion time (hours): 1.2

Precision Measurements Tools

MEA-2007 Bore Gauges

Course Description

Bore gauges are self-indicating, self-centering comparative gauges for detecting size deviations and shape defects of holes. Bore gauges ensure that the holes you inspect meet the requirements of the engineering specifications. In this course, you will gain the mastery required to accurately measure with a bore gauge.

By the end of this course, you will be able to

- Identify the most common types of bore gauges
- Define the characteristics of a precision hole
- Identify and explain the major components of bore gauges
- Demonstrate how to use different types of bore gauges to inspect hole size and hole shape

Estimated completion time (hours): 1.6

Precision Measurements Tools

MEA-2008 Height Gauges

Course Description

A height gauge is a measurement instrument used to measure vertical distances. Height gauges are very versatile and can be used to measure many different product characteristics. In this course, you will gain the mastery required to accurately measure with a height gauge.

By the end of this course, you will be able to

- Explain the purpose and function of a height gauge
- Identify the major components of a height gauge
- Define the measurement points of a height gauge measurement
- Use a height gauge to measure a vertical distance

Estimated completion time (hours): 1.1

Precision Measurements Tools

MEA-2009 Go/NoGo Gauges

Course Description

Go/NoGo gauges are used to inspect product features when a variable measurement is not necessary. Go/NoGo gauges make inspection of these features faster and more efficient. In this course, you will gain the mastery required to accurately measure with a Go/NoGo gauge.

By the end of this course, you will be able to

- Identify the different types of Go/NoGo gauges used to inspect holes
- Use a Go/NoGo gauge to inspect hole features

Estimated completion time (hours): 0.9

Precision Measurements Tools

MEA-2010 Test Indicators

Course Description

Test indicators are measurement tools that are used for comparative measurements. Test indicators are commonly used to determine form, shape, and positional deviations. In this course, you will gain the mastery required to accurately measure with a test indicator.

By the end of this course, you will be able to

- Explain the purpose of a test indicator
- Identify and define the major components of a test indicator
- Attach a test indicator to an external device
- Properly align the contact point of a test indicator
- Use a test indicator to perform a comparative measurement

Estimated completion time (hours): 1.1

Precision Measurements Tools

MEA-2011 Go/NoGo Thread Gauges

Course Description

Go/NoGo thread gauges are used to inspect the form of a threaded hole. Threads are one of the most common mechanical forms used to join parts. Understanding the terms associated with threads is important for anyone working with threaded holes and fasteners. In this course, you will gain the mastery required to accurately measure with a Go/NoGo thread gauge.

By the end of this course, you will be able to

- Identify the different types of threads
- List the components of a thread
- Use Go/NoGo thread gauges to inspect thread form
- List different types of Go/NoGo thread gauges
- Properly care for Go/NoGo thread gauges

Estimated completion time (hours): 1.4

Precision Measurements Tools

MEA-2012 Attribute Gauges

Course Description

Attribute gauges are designed to quickly inspect the size or function of a product characteristic. The term attribute gauge can be applied to many different types of inspection devices. In this course, you will gain the mastery required to accurately measure with attribute gauges.

By the end of this course, you will be able to

- Define the purpose of attribute gauges
- Explain the function and features of attribute gauges
- List the most common types of attribute gauges
- Identify the major components of attribute gauges
- Use an attribute gauge to inspect a product

Estimated completion time (hours): 1.0

Precision Measurements Tools

MEA-2013 Thickness and Radius Gauges

Course Description

Thickness and radius gauges are comparative measurement tools that are used when measuring gaps or rounded corners of workpieces. In this course, you will gain the mastery required to accurately measure with a thickness and radius gauges.

By the end of this course, you will be able to

- Explain the purpose and function of a thickness gauge
- Identify the major components of a thickness gauge
- Use a thickness gauge to make a comparative measurement
- Explain the purpose and function of a radius gauge
- Identify the major components of a radius gauge
- Use a radius gauge to measure the radius on a workpiece

Estimated completion time (hours): 1.0

Precision Measurements Tools

MEA-2014 Squares and Protractors

Course Description

Marking and inspecting perpendicular and angular surfaces is critical to produce quality products. Precision instruments called squares and protractors are used extensively to ensure squareness and accurate angles. In this course, you will gain the mastery required to accurately measure with squares and protractors.

By the end of this course, you will be able to

- List the parts of a solid square
- List the parts of a combination square
- Use a solid square to mark perpendicular lines
- Use a center head to find the center of a round part
- Use a combination square to measure and mark lines
- Use a protractor head to mark angular lines

Estimated completion time (hours): 1.3

Precision Measurements Tools

MEA-2015 Surface Roughness Comparators

Course Description

Surface roughness comparators are used to establish a basis for the feel of the roughness of surfaces on manufactured parts to a known roughness value. In this course, you will gain the mastery required to accurately measure with a surface roughness comparators.

By the end of this course, you will be able to

- Identify the characteristics of surface texture
- Identify a surface texture symbol on an engineering drawing
- Identify the components of the surface texture symbol
- Compare the roughness of a surface of a part to a surface roughness comparator

Estimated completion time (hours): 1.0

Precision Measurements Tools

MEA-2016 Adjustable Parallels

Course Description

An adjustable parallel is one of the most simple, yet versatile, precision instruments used in manufacturing. Understanding how to use an adjustable parallel is important for many individuals in manufacturing. In this course, you will gain the mastery required to accurately measure with adjustable parallels.

By the end of this course, you will be able to

- List uses of an adjustable parallel
- List the parts of an adjustable parallel
- Use an adjustable parallel and dial caliper to measure the width of a slot

Estimated completion time (hours): 0.7

Precision Measurements Tools

MEA-2017 Surface Plates

Course Description

Surface plates are a vital precision measurement tool. In this course, you will discover how to use and care for this precision instrument so that you can achieve accurate and precise measurements. In this course, you will gain the mastery required to accurately measure using a surface plate.

By the end of this course, you will be able to

- Describe a surface plate
- Identify other precision instruments that require a surface plate to measure products
- List product characteristics commonly measured with a surface plate and other precision instruments
- Identify common materials of surface plates
- List the three grades of surface plates
- Understand the quality differences between each grade
- Use best care practices

Estimated completion time (hours): 0.9

Precision Measurements Tools

MEA-2018 Optical Comparators

Course Description

Using an optical comparator, you can measure parts that may be difficult to measure with other devices. In this course, you'll discover the parts of an optical comparator and how they work together to create an enlarged image. You'll also learn about field of view, common methods of measurement, and proper care of an optical comparator.

By the end of this course, you will be able to

- Describe an optical comparator
- Identify the parts of an optical comparator
- Explain how an optical comparator works
- Understand the field of view
- Know common methods of measuring with an optical comparator
- Properly care for an optical comparator

Estimated completion time (hours): 0.9

Precision Measurements Tools

MEA-2019 Optical Center Finders

Course Description

Optical center finders are used to align a drill bushing with scribed hole location lines on a part.

They are very useful when the tolerances for hole location are critical. In this course, you will gain the mastery required to accurately measure with an optical center finder.

By the end of this course, you will be able to

- Define and explain the optical center finder
- Identify the components of a drill guide
- Use an optical center finder to align a drill bushing with scribed hole location lines

Estimated completion time (hours): 0.8

Fastener Inspection Gauges

MEA-2020 Grip Gauges

Course Description

The grip gauge is a precision measurement tool that is used measure material thickness to determine the proper fastener length when fastening two pieces of material together. Grip gauges are used in many different industries. In this course, you will gain the mastery required to accurately calculate grip length with the grip gauge.

By the end of this course, you will be able to

- Identify all of the parts of a grip gauge
- Describe how the parts work together to determine fastener length
- Use the grip gauge to accurately calculate fastener length
- Properly care for your grip gauge

Estimated completion time (hours): 0.8

Fastener Inspection Gauges

MEA-2021 Countersink Gauges

Course Description

The countersink gauge is a precision measurement tool that is used to measure the diameter of the top of a countersink. Countersink gauges are prevalent in the machining and aerospace industries. In this course, you will gain the mastery required to accurately measure with the countersink gauge.

By the end of this course, you will be able to

- Identify all of the parts of a countersink gauge
- Describe how the parts work together to measure a product
- Accurately use the countersink gauge to measure a diameter
- Properly care for your countersink gauge

Estimated completion time (hours): 1.3

Fastener Inspection Gauges

MEA-2022 Fastener Height Gauges

Course Description

The fastener height gauge is a precision measurement tool that is used to measure the distance from a countersunk fastener head to the surface of the material it is fastening. Fastener height gauges are widely used in the aerospace and fabrication industries. In this course, you will gain the mastery required to accurately measure products with the fastener height gauge.

By the end of this course, you will be able to

- Identify all of the parts of a fastener height gauge
- Describe how the parts work together to determine fastener height
- Use the fastener height gauge to accurately measure fastener height
- Properly care for your fastener height gauge

Estimated completion time (hours): 0.8

Fastener Inspection Gauges

MEA-2023 Rivet Inspection Gauges

Course Description

Installed rivets must be inspected to make sure the installation meets the engineering requirements. In this course, you will gain the mastery required to accurately measure with rivet inspection gauges.

By the end of this course, you will be able to

- Define all of the inspection requirements for a rivet installation
- Identify and explain all of the precision instruments used to inspect rivet installations
- Perform all of the inspection processes

Estimated completion time (hours): 0.9

Fastener Inspection Gauges

MEA-2024 Fastener Inspection Gauges

Course Description

Selecting and installing Hi-Lok and lockbolt fasteners is a complex process that requires the use of precision measurement instruments. Some of these precision instruments help you identify the correct fastener to use, while others ensure the installed fastener meets the engineering requirements. In this course, you will gain the mastery required to accurately measure fasteners with fastener gauges.

By the end of this course, you will be able to

- Identify all of the parts of a Hi-Lok fastener
- Identify all of the parts of a lockbolt
- Identify all of the fastener gauges
- Use the pin protrusion gauge to accurately measure a fastener installation
- Properly care for your fastener gauges

Estimated completion time (hours): 1.3

Fastener Inspection Gauges

MEA-2025 Gap Inspection Gauges

Course Description

Gap is defined as a space between two assembled components. Gap inspection gauges are used to measure these spaces. In this course, you will gain the mastery required to accurately measure gap with a variety of gauges.

By the end of this course, you will be able to

- Identify all of the parts of a Gapman gauge
- Describe how the parts work together to measure a product
- Interpret the measurement readings of the Gapman gauge
- Use the Gapman gauge to accurately measure a distance
- Properly care for your Gapman gauge

Estimated completion time (hours): 1.7

Weld Gauges

MEA-2026 Weld Gauges

Course Description

Measuring instruments designed to measure various weld dimensions and discontinuities are referred to as weld gauges. Understanding the function and use of these instruments is important for a technician who inspects welds. In this course, you will gain the mastery required to accurately measure with weld gauges.

By the end of this course, you will be able to

- Understand the uses of weld fillet gauges
- List the parts of an automatic weld size gauge
- Understand the uses of an automatic weld size gauge
- List the parts of a Hi-Lo gauge
- Understand the uses of a Hi-Lo gauge
- List the parts of a bridge cam gauge
- Understand the uses of a bridge cam gauge

Estimated completion time (hours): 2.2

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**NON-DESTRUCTIVE
EXAMINATION SKILLS
COURSES**

Introduction to Nondestructive Examination Aerospace

NDE-3001 What is NDE?

Course Description

Nondestructive examination (NDE) is the application of technical methods to inspect products without damaging them. Understanding the wide uses and benefits of nondestructive testing is valuable information for anyone involved in the manufacture, inspection, or maintenance of aerospace products.

By the end of this course, you will be able to

- Define nondestructive examination
- List industries that use nondestructive examinations
- List the benefits of using nondestructive examinations
- List organizations and agencies that regulate nondestructive examinations

Estimated completion time (hours): 1.0

Introduction to Nondestructive Examination Aerospace

NDE-3002 NDE Methods

Course Description

There are many ways of performing a nondestructive examination. Understanding the various NDE processes is important information for the NDE technician.

By the end of this course, you will be able to

- Define a discontinuity
- Define an indication
- Understand the difference between false, nonrelevant, and relevant indications
- Define a flaw
- Define a defect
- List common NDE methods
- List some advanced NDE methods
- Understand the difference between a method and a technique

Estimated completion time (hours): 1.3

Introduction to Nondestructive Examination Aerospace

NDE-3003 Careers in NDE

Course Description

There are many different levels and career paths for an NDE technician. Understanding the requirements that you must meet as an NDE technician is important information in deciding on a career in NDE.

By the end of this course, you will be able to

- Distinguish between qualification and certification
- List the two practices of certifying NDE technicians
- List common levels of NDE technicians
- Understand the training and work experience requirements for the various levels and NDE methods
- List common aerospace standards that recommend the training and work experience requirements

Estimated completion time (hours): 1.9

Visual Testing Aerospace

NDE-3004 Introduction to Visual Testing

Course Description

Visual testing is a common method of inspecting aircraft and aircraft components. In fact, it is often the first step in inspecting any product. Indications of defects, such as cracks around rivets, can often be found by performing a visual test.

By the end of this course, you will be able to

- Define visual testing
- Understand a brief history of visual testing
- List visual testing techniques

Estimated completion time (hours): 1.0

Visual Testing Aerospace

NDE-3005 Light and the Human Eye

Course Description

Light is a critical element in the success of a visual test procedure. The quantity and direction of light are key factors in detecting indications when performing a visual test.

By the end of this course, you will be able to

- Define light
- Understand the properties of light
- Define illumination
- Define luminance
- Understand reflection, absorption, refraction, and transmission of light
- Understand the components and functions of the human eye
- Understand contrast

Estimated completion time (hours): 2.3

Visual Testing Aerospace

NDE-3006 Standard Inspection Techniques

Course Description

An NDE technician may conduct visual testing using a direct or indirect technique. While direct visual testing allows a technician to view a test object within their reach, indirect visual testing requires the use of optical devices to view an inaccessible test surface.

By the end of this course, you will be able to

- List visual testing techniques
- Identify the differences between direct and indirect visual testing
- Identify the difference between direct local visual testing and general visual testing

Estimated completion time (hours): 1.0

Visual Testing Aerospace

NDE-3007 Visual Testing Equipment

Course Description

Visual testing often requires a technician to use a variety of equipment. A technician may be required to use a borescope, fiberscope, videoscope, or camera.

By the end of this course, you will be able to

- List the properties of a magnifier
- Understand the effects of the shape of mirrors
- Identify the parts of a borescope
- Understand the differences between a borescope, fiberscope, and videoscope
- Understand the role a camera plays in indirect visual testing

Estimated completion time (hours): 1.3

Visual Testing Aerospace

NDE-3008 Manufacturing Produced Discontinuities

Course Description

Discontinuities can occur at any time in the many steps involved in producing a manufactured product. However, certain types of discontinuities are more common to specific manufacturing stages.

By the end of this course, you will be able to

- List casting and wrought processes
- Identify the differences between casting and wrought processes
- List types of casting discontinuities
- List types of discontinuities common to wrought products
- Identify types of discontinuities common in secondary processes

Estimated completion time (hours): 2.6

Visual Testing Aerospace

NDE-3009 Standards and Procedures

Course Description

In this course, you'll find out about the importance of standards that a product must meet. You'll also learn about standards that each component of a product must meet and what to do when the standards conflict.

By the end of this course, you will be able to

- Understand the hierarchy of standards
- List the contents of a design standard
- Know what to do in case of a conflict between standards
- List what a procedure document needs to include

Estimated completion time (hours): 0.8

Visual Testing Aerospace

NDE-3010 Visual Testing of Castings

Course Description

The visual testing of castings typically includes dimensional measurements and the evaluation of surface roughness and surface discontinuities.

By the end of this course, you will be able to

- Understand how casting surfaces and discontinuities are compared to photographs and solid replicas
- Know the differences between comparators for the same type of surface irregularity
- Understand how the casting process affects the quality of a casting
- Understand the relationship between a quality level and the required comparators

Estimated completion time (hours): 1.1

Visual Testing Aerospace

NDE-3011 Visual Testing of Wrought Metal

Course Description

The visual testing of wrought metal products is typically performed to confirm the product meets a specific standard. Understanding the requirements in a common standard and how to measure discontinuities is important information for the visual testing technician.

By the end of this course, you will be able to

- Understand common requirements in standards for wrought metal products
- Recognize typical discontinuities of wrought products
- Know how to measure a discontinuity's depth
- Identify arrangements of discontinuities
- Determine the affected area of discontinuities

Estimated completion time (hours): 0.9

Visual Testing Aerospace

NDE-3012 Visual Testing of Welds

Course Description

Visual testing is typically the first NDE method used in the inspection of welds. Understanding the process of performing a visual test on welds is important information for the visual testing technician.

By the end of this course, you will be able to

- Describe the process of visually testing a weld
- Understand the information in a weld procedure specification
- Understand the importance of the procedure qualification report
- Understand what to look for during each stage of the welding process
- Know what to include on a visual test report

Estimated completion time (hours): 1.4

Visual Testing Aerospace

NDE-3013 In-Service Visual Inspection

Course Description

Visual testing often requires the inspection of products after they are manufactured and in-service. Understanding the types of discontinuities and defects that arise while a product is in use is important information for the visual testing technician.

By the end of this course, you will be able to

- List common discontinuities found in aircraft that are in-service
- Define corrosion
- Understand the cause of corrosion
- Understand the relationship of corrosion and stress
- List areas of an aircraft that are highly prone to corrosion
- List good practices for conducting a visual test
- Understand how to use IES illumination recommendations

Estimated completion time (hours): 2.6

Magnetic Particle Testing Aerospace

NDE-3014 Magnetic Particle Examination

Course Description

Magnetic particle examination is a widely used nondestructive examination method used to detect surface and near-surface discontinuities on components made of metals that are capable of being magnetized.

By the end of this course, you will be able to

- Define the general capabilities of magnetic particle examination
- List the early uses of magnetic particle testing
- List benefits and limitations of magnetic particle testing
- List aircraft components inspected with the magnetic particle testing method
- List the three basic steps to conduct a magnetic particle examination

Estimated completion time (hours): 0.9

Magnetic Particle Testing Aerospace

NDE-3015 Magnetism

Course Description

Magnetism is the force exerted by an object to attract or repel other objects based on the material in each object. Magnetism is an important concept in physics with many applications in industry.

By the end of this course, you will be able to

- Define magnetism
- Understand the principles of magnetism
- Understand how all forms of matter are affected by magnetic fields
- Define induced magnetism
- Understand the differences among diamagnetism, paramagnetism, and ferromagnetism
- Define a permanent magnet
- Define a temporary magnet
- Define an electromagnet
- Identify a bar magnet
- Identify a horseshoe magnet
- Define magnetic field

Estimated completion time (hours): 1.3

Magnetic Particle Testing Aerospace

NDE-3016 Magnetic Flux

Course Description

A magnetic field is composed of a countless number of magnetic lines of force. Knowledge about these lines of force is important in understanding the strength of magnetic fields.

By the end of this course, you will be able to

- Define magnetic flux lines
- Define a leakage field
- Understand the relationship between the size and orientation of a discontinuity with a leakage field
- Define units of measure of magnetic force
- Distinguish between magnetic flux and magnetic flux density
- Identify units of measure for magnetic flux and magnetic flux density

Estimated completion time (hours): 0.9

Magnetic Particle Testing Aerospace

NDE-3017 Electricity and Magnetism

Course Description

Electricity and magnetism are two subjects in physics that are important in all areas of industry. Understanding how the two subjects are interconnected is important in understanding the principle of electromagnetism.

By the end of this course, you will be able to

- Define electromagnetism
- Understand the relationship between electricity and magnetism
- Understand the two theories that describe electrical current
- Understand electrical current
- Identify the components of an electrical circuit
- List the purposes of a power supply
- Identify the differences among direct, alternating, full-wave rectified alternating, and half-wave rectified alternating types of electrical current
- Understand the shape and direction of a magnetic field around a current carrying straight conductor
- Understand the shape and direction of a magnetic field around a current carrying coiled conductor

Estimated completion time (hours): 1.9

Magnetic Particle Testing Aerospace

NDE-3018 Electromagnets

Course Description

Electromagnets have a wide variety of uses in all areas of industry. Additionally, the ability to temporarily create an electromagnet from a part made of ferromagnetic metals is key to performing magnetic particle examinations.

By the end of this course, you will be able to

- Define magnetic field strength
- Understand the unit of measure for magnetic field strength
- Differentiate between B and H fields
- Understand the effect of a material's permeability on the B field
- Define relative permeability
- Understand why a ferromagnetic metal has varying permeability
- Define coercive force
- Understand the relationship among residual magnetism, retentivity, and saturation
- Understand the relationship of magnetic field strength and magnetic flux density fields as represented by a hysteresis loop
- Understand the effects the properties of a ferromagnetic metal have on the hysteresis loop

Estimated completion time (hours): 1.5

Magnetic Particle Testing Aerospace

NDE-3019 Cast Ferromagnetic Metals

Course Description

Magnetic particle inspection is limited to the examination of parts made of ferromagnetic metals. Examining these parts is critical because ferromagnetic metal parts are often required to have great strength and failure of these parts can have catastrophic consequences.

By the end of this course, you will be able to

- List common properties of metals
- Understand the differences among carbon, alloy, and stainless steels
- List the main elements in carbon steels
- List common alloying elements
- List the three stages of producing metal parts
- List common discontinuities in primary metals
- Understand the difference between cast and wrought metal processes
- Distinguish between discontinuities commonly found in cast metals

Estimated completion time (hours): 2.4

Magnetic Particle Testing Aerospace

NDE-3020 Wrought Ferromagnetic Metals

Course Description

Magnetic particle inspection is limited to the examination of parts made of ferromagnetic metals. Examining these parts is critical because ferromagnetic metal parts are often required to have great strength and failure of these parts can have catastrophic consequences.

By the end of this course, you will be able to

- Understand the difference between hot and cold wrought metal processes
- Understand the forging process
- List the two common hot forging processes
- List wrought metal processes
- List wrought metal products produced from cast blooms, billets, and slabs
- Distinguish between discontinuities commonly found in wrought metals

Estimated completion time (hours): 1.1

Magnetic Particle Testing Aerospace

NDE-3021 Secondary Metal Processing

Course Description

Secondary processing is required to transform cast and wrought metal products into finished metal parts. Secondary processes include machining, fabrication, thermal treatments, and surface finishing.

By the end of this course, you will be able to

- List common machining processes
- List discontinuities common to cutting and abrasive machining operations
- List common fabrication processes
- List discontinuities common to fabrication processes
- Understand the differences among the various heat treatments
- Define a quench crack
- Understand the severe danger of hydrogen embrittlement

Estimated completion time (hours): 1.9

Magnetic Particle Testing Aerospace

NDE-3022 Introduction to Magnetic Particle Examination Equipment and Materials

Course Description

There are many types of equipment and materials used in magnetic particle examinations. Understanding the different types is important information for the NDE technician.

By the end of this course, you will be able to

- List types of equipment used in magnetic particle examinations
- List types of materials used in magnetic particle examinations
- List organizations that control standards to which magnetic particle equipment and materials are manufactured

Estimated completion time (hours): 4.0

Magnetic Particle Testing Aerospace

NDE-3023 Non-Portable Magnetic Particle Examination Equipment

Course Description

There are many types of non-portable magnetic equipment. Understanding the differences among these types is important information for the NDE technician.

By the end of this course, you will be able to

- List types of non-portable magnetic equipment
- Understand the differences among the types of non-portable magnetic equipment
- List common components and accessories of non-portable equipment

Estimated completion time (hours): 1.0

Magnetic Particle Testing Aerospace

NDE-3024 Portable Magnetic Particle Examination Equipment

Course Description

There are many types of portable magnetic equipment. Understanding the differences among these types is important information for the NDE technician.

By the end of this course, you will be able to

- List types of portable magnetic equipment
- Understand the differences among the types of portable magnetic equipment
- List common components of yokes
- Understand the capabilities of yokes

Estimated completion time (hours): 1.0

Magnetic Particle Testing Aerospace

NDE-3025 Lighting Equipment

Course Description

Proper lighting is essential for an NDE technician to view indications. Understanding the different methods of lighting test objects is important information for the technician to be able to perform MT examinations properly.

By the end of this course, you will be able to

- Define visible light
- Understand the requirements of visible light in magnetic particle testing
- Define ultraviolet light
- Understand the requirements of ultraviolet light in magnetic particle testing
- Understand the limits of visible light when ultraviolet lighting is used
- Understand the dangers of ultraviolet light

Estimated completion time (hours): 1.0

Magnetic Particle Testing Aerospace

NDE-3026 Magnetic Particle Materials

Course Description

The materials used in magnetic particle examinations are critical to the success of magnetic particle examinations. Understanding the properties of these materials is important information for NDE technicians.

By the end of this course, you will be able to

- Distinguish between dry and wet particle techniques
- Understand the importance of clumping in wet particles and when it should occur
- Identify the important properties of liquids used in the wet particle technique
- Understand how to check the concentration of baths
- Understand how to check for carrier contamination
- Understand how to check for particle contamination
- List conditions that utilize dry particles best
- List conditions that utilize wet particles best
- List advantages of using ultraviolet light and fluorescent particles

Estimated completion time (hours): 1.0

Magnetic Particle Testing Aerospace

NDE-3027 Field Testing Devices

Course Description

Field testing devices help ensure the accuracy of magnetic particle examinations. Understanding the uses of these devices and when they are used is important information for the NDE technician.

By the end of this course, you will be able to

- Understand the use of a test ring
- Understand the use of Quantitative Quality Indicators
- Understand the use of a pie field indicator
- Understand the use of a field indicator
- Understand when axial and transverse probes are used in gauss meters

Estimated completion time (hours): 1.0

Magnetic Particle Testing Aerospace

NDE-3028 Light Meters

Course Description

Light meters are used in many NDE examination process checks to ensure the required illumination or ultraviolet radiation level is met. Understanding the capabilities of these devices is important information for the NDE technician.

By the end of this course, you will be able to

- List common components of light meters
- List different type of light meters
- Understand common functions of a universal light meter

Estimated completion time (hours): 1.0

Magnetic Particle Testing Aerospace

NDE-3029 Part Preparation

Course Description

Properly preparing a test part for a magnetic particle examination is critical for the accuracy of the examination. The preparation requirements are important knowledge the NDE technician must have to successfully examine the test part.

By the end of this course, you will be able to

- List various cleaning methods of test parts
- List other part preparation processes
- Understand part preparation requirements for testing with dry particles
- Understand the part preparation requirements for testing with wet particles

Estimated completion time (hours): 0.9

Magnetic Particle Testing Aerospace

NDE-3030 Technique Selection

Course Description

There are many factors that are considered when selecting the proper technique to perform a magnetic particle examination. The selection process is important knowledge for the NDE technician.

By the end of this course, you will be able to

- List factors in determining the proper magnetic particle examination technique
- List factors in determining other variables in the selected technique
- Understand the difference between direct and indirect magnetization of a part
- List topics in a magnetic particle written procedure that are commonly required
- Define a head shot
- Define a coil shot

Estimated completion time (hours): 1.1

Magnetic Particle Testing Aerospace

NDE-3031 Magnetizing Currents

Course Description

There are many factors that are considered when selecting the type of current and calculating the amperage required to magnetize a part. Understanding these calculations is important knowledge for the NDE technician.

By the end of this course, you will be able to

- List factors that affect the required amperage to magnetize a part
- Identify parts and coils that are classified as low, intermediate, and high fill factors
- Identify parts and central conductors that are classified as low, intermediate, and high fill factors
- Calculate amperage required for a head shot
- Calculate amperage required for a coil shot
- Calculate amperage required for a central conductor
- Identify the effective magnetized region of a part in a coil
- Identify the effective magnetized region of a part centered on a central conductor
- Identify the effective magnetized region of a part offset on a central conductor

Estimated completion time (hours): 1.6

Magnetic Particle Testing Aerospace

NDE-3032 Sample Examination #1

Course Description

Understanding why the parameters are chosen for a specific magnetic particle examination is important information for an NDE technician.

By the end of this course, you will be able to

- Understand why the shapes of magnetic fields are chosen for a specific examination
- Understand which type of particles are chosen for the examination
- Understand which type of current is chosen
- Understand which formula to use for magnetizing the part

Estimated completion time (hours): 0.7

Magnetic Particle Testing Aerospace

NDE-3033 Sample Examination #2

Course Description

Understanding which parameters are chosen for a magnetic particle examination using a central conductor is important information for a technician.

By the end of this course, you will be able to

- Understand why the shapes of magnetic fields are chosen for a specific examination
- Understand which type of particles are chosen for the examination
- Understand which type of current is chosen
- Understand which formula to use for magnetizing the part

Estimated completion time (hours): 0.7

Magnetic Particle Testing Aerospace

NDE-3034 Sample Examination #3

Course Description

When working with a yoke, it is important for a technician to understand which parameters are chosen for a magnetic particle examination.

By the end of this course, you will be able to

- Understand where to position the yoke to form indications that may lie in any direction
- Understand which type of particles are chosen for the examination
- Understand which type of yoke is chosen

Estimated completion time (hours): 0.7

Magnetic Particle Testing Aerospace

NDE-3035 Sample Examination #4

Course Description

Understanding which parameters are chosen for a magnetic particle examination using a portable power supply and accessories is important information for a technician.

By the end of this course, you will be able to

- Understand which accessories to use to form indications that may lie in any direction
- Understand which type of particles are chosen for the examination
- Understand which type of current is chosen
- Understand how to calculate the required amperage and number of turns for a cable wrap
- Understand how to calculate the amperage for a contact shot

Estimated completion time (hours): 0.8

Magnetic Particle Testing Aerospace

NDE-3036 Magnetic Particle Examination Standards

Course Description

Standards provide common recommendations and requirements for conducting magnetic particle examinations. Understanding the contents of a standard is important to an NDE technician.

By the end of this course, you will be able to

- Understand the contents of ASTM E1444
- List other standards often used in magnetic particle examinations
- Understand the difference between a standard guide and a standard practice
- Understand the meaning of "Shall," "Should," "May," and "Will" as they are used in standards and specifications

Estimated completion time (hours): 1.5

Introduction to Nondestructive Examination Commercial

NDE-3037 What is Nondestructive Examination?

Course Description

The field of nondestructive examination touches many of the products that you use every day. In this course, you will begin to learn about this broad field and where it is used.

By the end of this course, you will be able to

- Define nondestructive examination
- Describe the benefits of nondestructive examination
- List industries that use nondestructive examination
- List organizations that regulate the safety and reliability of products and services
- Describe career opportunities in the field of nondestructive examination

Estimated completion time (hours): 1.0

Introduction to Non-destructive Examination Commercial

NDE-3038 The NDE Process

Course Description

A wide variety of methods are used to perform nondestructive examination (NDE). These methods use the same general process and common terminology. Understanding these key concepts is the first step in understanding the field of NDE.

By the end of this course, you will be able to

- Define terminology used in the field of NDE
- Describe where NDE is used
- Describe different methods of NDE
- Describe the NDE process

Estimated completion time (hours): 1.2

Introduction to Non-destructive Examination Commercial

NDE-3039 Materials

Course Description

In this course, you'll discover why it's important that NDE technicians have some knowledge of material science. In particular, you'll learn about the properties of metals, ceramics, polymers, and composites.

By the end of this course, you will be able to

- Define terms used to describe materials
- List the properties of metals
- List the properties of ceramics
- List the properties of polymers
- List the properties of composites

Estimated completion time (hours): 0.8

Introduction to Non-destructive Examination Commercial

NDE-3040 Metals Manufacturing and Processes

Course Description

Understanding metals manufacturing and processes is vital to your success as an NDE technician. Although discontinuities can occur at any time during the manufacturing of a product, certain types of discontinuities are more common during specific manufacturing stages.

By the end of this course, you will be able to

- Define terms used in metals manufacturing and process
- Describe casting and wrought processes
- Identify various types of inherent and processing discontinuities
- Describe assembly, surface treatment, and strengthening processes

Estimated completion time (hours): 1.1

Introduction to Non-destructive Examination

NDE-3041 Testing of Material Properties

Course Description

The fields of nondestructive and destructive testing are related. An NDE technician must have a thorough understanding of material properties, most of which are commonly established by destructive testing.

By the end of this course, you will be able to

- List three groups of material properties
- Describe testing methods used to establish material properties
- List key points on the engineer's stress-strain diagram
- List the stages of fatigue
- List the stages of creep
- Describe several methods of hardness testing

Estimated completion time (hours): 3.4

Introduction to Non-destructive Examination

NDE-3042 Loads, Stresses, and Discontinuities

Course Description

In this course, you'll learn about the five different types of service loads, as well as common discontinuities. You'll also understand different types of in-service discontinuities.

By the end of this course, you will be able to

- Understand the difference between inherent, processing, and service-induced discontinuities
- Define static and dynamic loading
- Describe the five fundamental types of loading
- Define stress and strain
- Understand two categories of deformation
- Define creep
- Know the difference between constant and varying loads
- Understand the different types of in-service discontinuities
- Understand the difference between a defect and a discontinuity

Estimated completion time (hours): 1.3

Introduction to Non-destructive Examination

NDE-3043 Fracture Mechanics

Course Description

Fracture mechanics is an engineering discipline where the presence of a crack is assumed. It

makes quantitative relations among the crack depth, its length, the material's inherent resistance to crack growth, and the determination of the ultimate stress intensity at which the crack propagates to cause structural failure. Fracture mechanics relies on the results of nondestructive examination to help predict when flawed parts might fail.

By the end of this course, you will be able to

- Define fracture mechanics
- Define dormant and dynamic flaws
- List three modes of fracture
- Define terms used in fracture mechanics
- Understand flaw characterization
- Understand the role NDE plays in fracture mechanics analysis

Estimated completion time (hours): 0.9

Introduction to Non-destructive Examination

NDE-3044 NDE Methods

Course Description

This course provides a general overview of the six major categories of NDE methods, including their advantages and limitations. Learning about the general capabilities of the various NDE technologies will assist you in choosing the appropriate NDE method or methods when testing for product integrity or assessing the condition of a product.

By the end of this course, you will be able to

- Describe each NDE method
- Identify where each method is used
- List the advantages of each method
- List the limitations of each method

Estimated completion time (hours): 1.9

Introduction to Non-destructive Examination

NDE-3045 Personnel Qualification

Course Description

Before performing NDE, a technician must be qualified and certified. In this course, you will learn about global processes for personnel qualification and certification and specific requirements used in the United States.

By the end of this course, you will be able to

- Describe the process for personnel qualification
- Compare employer-based certification to central certification
- Define terminology, including qualification, certification, and recommended practice
- Define three levels of personnel qualification
- Understand that the initial training and experience requirements are greater for more complex NDE methods
- Describe what is typically included in an organization's NDE Personnel Qualification and Certification written practice

Estimated completion time (hours): 0.8

Visual Testing Commercial

NDE-3046 Introduction to Visual Testing

Course Description

Visual testing is the most common method of nondestructive testing. In fact, most nondestructive applications rely on a visual assessment of parts or components prior to applying their specific test inspection method. Without visual testing, discontinuities, such as cracks in aircraft parts, may be missed, potentially leading to life-ending tragedies.

By the end of this course, you will be able to

- Define nondestructive visual testing
- Understand the history of visual testing
- List applications of visual testing
- Define common terms associated with visual testing

Estimated completion time (hours): 1.1

Visual Testing Commercial

NDE-3047 Light

Course Description

Light and vision are key factors in the success of visual testing. Detecting discontinuities depends on how well a technician can see them, which is influenced by the quantity and direction of light.

By the end of this course, you will be able to

- Describe the physics of light
- Understand the difference between artificial and natural light sources
- Recognize the effect of different amounts of light and light direction on visual testing
- Define key terms related to light and vision
- Know how to measure illumination
- Understand reflected and refracted light
- Learn about different types of lenses
- Describe how the human eye processes light

Estimated completion time (hours): 2.6

Visual Testing Commercial

NDE-3048 Standard Inspection Techniques

Course Description

An NDE technician may conduct visual testing directly or indirectly. While direct visual testing gives the technician an uninterrupted line of sight to the test object, indirect visual testing requires the use of visual aids to achieve a line of sight to the test object.

By the end of this course, you will be able to

- List the basic techniques used in visual testing
- Understand the differences between direct and indirect visual testing
- Understand the difference between local direct visual testing and general visual testing

Estimated completion time (hours): 1.5

Visual Testing Commercial

NDE-3049 Visual Testing Equipment

Course Description

An NDE technician may use several different types of equipment and optical aids to perform visual testing. In this course, you'll discover how a borescope, fiberscope, and videoscope work. You'll also learn the roles cameras and resolution charts play in visual testing.

By the end of this course, you will be able to

- Identify the parts of a borescope
- Understand the differences between a borescope, fiberscope, and videoscope
- Understand the role a camera plays in indirect visual testing
- Identify the parts of an indirect visual test system

Estimated completion time (hours): 0.6

Visual Testing Commercial

NDE-3050 Hierarchy of Product Standards

Course Description

In this course, you'll find out about the hierarchy of standards, which dictates the general requirements a test product must meet. You'll also learn about other standards that may be required and what to do when the standards conflict.

By the end of this course, you will be able to

- Understand the hierarchy of standards
- List the requirements of the design standard
- Know what to do in case of a conflict between standards
- List what procedure documents need to include

Estimated completion time (hours): 0.9

Visual Testing Commercial

NDE-3051 Visual Testing of Castings

Course Description

Standards play an important role in visual testing. Depending on the standard required, the NDE technician can compare the test object to photographs, actual replicas of surface irregularities, and written criteria.

By the end of this course, you will be able to

- Understand how photographs and replicas of surface irregularities are used in visual testing
- Know the differences between comparators for the same type of surface irregularity

Estimated completion time (hours): 1.0

Visual Testing Commercial

NDE-3052 Visual Testing of Rolled Products

Course Description

In this course, you'll learn the difference between an imperfection and a defect. You'll also discover discontinuities common in rolling and drawing.

By the end of this course, you will be able to

- Understand the difference between an imperfection and a defect
- Recognize typical discontinuities of rolled products
- Know how to measure a discontinuity's depth
- Identify common discontinuity arrangements
- Understand the process for repairing affected areas

Estimated completion time (hours): 0.9

Visual Testing Commercial

NDE-3053 Visual Testing of Welds

Course Description

In this course, you'll find out about the process of visually testing welds. You'll also discover the importance of meeting acceptance standards, as well as the information required on a typical visual test report.

By the end of this course, you will be able to

- Understand NDE examination symbols used on engineering drawings or instructions
- Describe the process of visually testing a weld
- Understand when visual testing of a weld may occur
- Understand what to look for during each stage of the welding process
- Know what basic information is needed for a visual test report

Estimated completion time (hours): 1.4

Visual Testing Commercial

NDE-3054 VT in Industrial Components

Course Description

In this course, you'll become acquainted with common industrial components, such as storage tanks, pressure vessels, piping, valves, pumps, hangers, and supports.

By the end of this course, you will be able to

- Understand the working principles of common industrial components
- Describe different types of valves
- Describe three different functions of valves
- Describe different types of pumps
- Describe different types of hangers and supports
- Describe the operation of common industrial components
- Identify discontinuities common in industrial components

Estimated completion time (hours): 1.4

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PROGRAMMABLE LOGIC CONTROLLERS SKILLS COURSES

Programmable Logic Controllers

PLC-1001 Introduction to Programmable Controllers

Course Description

Programmable controllers are industrial, programmable circuits used to control production processes. They are a low-cost and powerful alternative for directing and managing automated systems in all types of industries.

By the end of this course, you will be able to

- Describe the historical evolution of programmable controllers
- Understand the role and importance of programmable controllers in automated processes
- Become familiar with the most typical applications of programmable controllers

Estimated completion time (hours): 1.0

Programmable Logic Controllers

PLC-1002 Introduction to Digital Electronics

Course Description

Digital electronics is the foundation of programmable logic controllers. Digital devices like PLCs use circuits programmed with a logic system to determine the output based on one or more inputs. Understanding how digital circuits work will help you better understand how a PLC operates.

By the end of this course, you will be able to

- Define digital electronics
- Identify the number systems used by PLCs
- Identify the data types used by PLCs
- Identify and define the logic gates used in PLC programming
- Understand how logic gates function
- Identify the symbols for logic gates

Estimated completion time (hours): 1.5

Programmable Logic Controllers

PLC-2001 Types and Functions of Programmable Controllers

Course Description

Programmable controllers are frequently used in automatic control systems to control machines and processes. There are many different types and functions of programmable controllers in use today. Their applications are diverse, ranging from commercial to residential to industrial.

By the end of this course, you will be able to

- Describe the different types of programmable controllers
- Identify the functions of the different types of programmable controllers
- Provide examples of typical applications for the different types of programmable controllers

Estimated completion time (hours): 0.8

Programmable Logic Controllers

PLC-2002 General Structure of PLC

Course Description

A PLC is built using the same basic components that are found in the personal computer at your home, school, or business. Because a PLC is used for industrial operations, specialized components are available that allow it to communicate with and control automated equipment.

By the end of this course, you will be able to

- Identify the main components of a generic PLC
- Identify the sub-components of each main component
- Identify the various configurations of the main components

Estimated completion time (hours): 1.4

Programmable Logic Controllers

PLC-2003 Physical Integration of the PLC

Course Description

PLCs are designed to be integrated with machines and devices to monitor and control automated processes. The integration is achieved through a series of electrical connections that allow the PLC to receive, process, and send electrical signals.

By the end of this course, you will be able to

- Become familiar with the different ways of providing electrical power to a PLC
- Identify the different methods of connecting sensors and devices to input courses
- Identify the different methods of connecting devices to output courses

Estimated completion time (hours): 1.3

Programmable Logic Controllers

PLC-2004 Internal Structure of the CPU

Course Description

The CPU contains the elements that form the intelligence of the PLC. Understanding the components of the CPU and how they interact will help you gain the base knowledge needed to understand a PLC user program.

By the end of this course, you will be able to

- Identify the different sections of the CPU and their interactions
- Describe how the information and data are processed and stored inside the CPU
- List different areas of memory
- Identify the elements of a logical address

Estimated completion time (hours): 1.2

Programmable Logic Controllers

PLC-2005 Basic Concepts of PLC Programming

Course Description

In order for a PLC to control an automated machine or process, it must be given a set of instructions. These instructions, or user programs, tell the PLC what inputs to monitor, how to process the data, and how to respond to the inputs.

By the end of this course, you will be able to

- Identify the four steps a PLC performs during operation
- Define the term input scan
- Define the term program scan
- Define the term output scan
- Identify the symbols representing normally open and normally closed contact relays
- Identify the two structures used for programming

Estimated completion time (hours): 1.6

Programmable Logic Controllers

PLC-2006 Common PLC Applications

Course Description

In this course, you will see examples of real world PLC operations and examples of ladder logic and GRAFCET programs used to control the PLC.

By the end of this course, you will be able to

- Understand solutions for different real world applications using PLCs

Estimated completion time (hours): 1.7

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POWER TOOLS SKILLS COURSES

Hand Power Tools

POW-2001 Pistol Grip Drills

Course Description

Drill motors convert pneumatic or electrical power into rotational motion, which is used to rotate drill bits or other accessories mounted in the drill motor. These hand tools are used in many different areas of manufacturing.

By the end of this course, you will be able to

- List common types of drill motors
- Describe the components of a drill motor

Estimated completion time (hours): 0.8

Hand Power Tools

POW-2002 Drilling Techniques

Course Description

A quality hole results in less rework and lower overall manufacturing costs. In this course, you will learn about good drilling techniques which will help ensure you know how to drill a quality hole.

By the end of this course, you will be able to

- List the characteristics of a quality hole
- Describe how different speeds and amounts of pressure affect the quality of a hole
- Describe how heat affects the quality of a hole
- Describe deburring tools
- Describe common hole defects

Estimated completion time (hours): 1.1

Hand Power Tools

POW-2003 Winslow Drills

Course Description

This course introduces you to a specialized drill motor called the Winslow drill. The Winslow drill enables you to drill multiple holes at the same time, ensuring that they are oriented correctly in relation to the hole for a special fastener.

By the end of this course, you will be able to

- Describe the parts of a Winslow drill
- Explain how to adjust the countersink depths
- Describe the operation of a Winslow drill

Estimated completion time (hours): 0.7

Hand Power Tools

POW-2004 Compression Riveters

Course Description

Pneumatic compression riveters, sometimes called squeeze riveters or rivet squeezes, allow a single person to install rivets faster and more consistently than when using a pneumatic rivet gun.

By the end of this course, you will be able to

- Describe two types of compression riveters
- List the components of a compression riveter
- List the components of compression riveter dies
- Explain setting up a compression riveter
- Describe installing a rivet with a compression riveter

Estimated completion time (hours): 0.9

Hand Power Tools

POW-2005 Rivet Installation Tools

Course Description

Rivet guns and blind rivet pullers are used to install rivets by driving or pulling them. These tools make it possible to join workpieces into an assembly.

By the end of this course, you will be able to

- List the components of a rivet gun
- Explain the purpose of a bucking bar
- Describe how a rivet is installed using a rivet gun
- List the components of a blind rivet puller
- Describe how a rivet is installed using a blind rivet puller

Estimated completion time (hours): 1.1

Stationary Power Tools

POW-2006 Introduction to Stationary Power Tools

Course Description

Power island equipment is stationary, floor-mounted power tools used in the manufacture of products. In this course, you will learn about the power island, some of the equipment found in the power island, and the necessary safety precautions when using power island equipment.

By the end of this course, you will be able to

- Define power island
- Identify the common equipment in the power island
- Explain general safety precautions to use with power island equipment

Estimated completion time (hours): 1.0

Stationary Power Tools

POW-2007 Disc and Belt Sanders

Course Description

Disc and belt sanders are two of the machines you will find in the power island area. They are power tools used for removing material, rounding corners, breaking edges, deburring, and chamfering.

By the end of this course, you will be able to

- Define disc sander
- Define belt sander
- Identify the common components of the disc sander and belt sander
- Explain general safety precautions used with the disc and belt sanders
- Understand how to properly use the sanders

Estimated completion time (hours): 1.3

Stationary Power Tools

POW-2008 Drill Press

Course Description

The drill press is a common tool in a power island area that is used to create holes in metal, wood, plastic, and other materials.

By the end of this course, you will be able to

- Explain the purpose of a drill press
- Identify the major components of the drill press
- Explain general safety precautions used with the drill press
- Understand how to properly use the drill press

Estimated completion time (hours): 1.2

Stationary Power Tools

POW-2009 Band Saw

Course Description

The band saw is a power tool used for trimming straight and contouring wood, fiber, plastic, and sheet metal. In this course you will learn about the band saw, its major components, its proper use, and the necessary safety precautions when using this tool.

By the end of this course, you will be able to

- Define band saw
- Identify the common components of the band saw
- Explain general safety precautions used with the band saw
- Understand how to properly use the band saw

Estimated completion time (hours): 1.2

Stationary Power Tools

POW-2010 Arbor Press

Course Description

An arbor press is a tool that is used to press together or take apart components of an assembly. It is a common tool in the power island area of the manufacturing plant.

By the end of this course, you will be able to

- Define the purpose of an arbor press
- Identify and explain the major components of an arbor press
- Describe how arbor presses are rated
- Use an arbor press to press-fit a dowel pin
- Use an arbor press to press-fit a liner bushing

Estimated completion time (hours): 1.1

Stationary Power Tools

POW-2011 Bench Grinder

Course Description

Bench grinders are stationary power tools that are used to quickly remove material from a workpiece. They are also used for sharpening and polishing operations.

By the end of this course, you will be able to

- Define and explain the major components of a bench grinder
- Explain the hazards of the bench grinder
- Install a new wheel on the bench grinder
- Grind a simple part on the bench grinder

Estimated completion time (hours): 1.2

Stationary Power Tools

POW-2012 Table Saw

Course Description

The table saw is a power tool used for cutting wood, plastic, composite, and other materials to precise sizes and angles. In this course, you will learn about the table saw, its major components, its proper use, and the necessary safety precautions when using this tool.

By the end of this course, you will be able to

- Define table saw
- Identify the common components of the table saw
- Explain general safety precautions used with the table saw
- Understand how to make adjustments to features of the table saw
- Distinguish between rip, crosscut, bevel, and miter cuts

Estimated completion time (hours): 1.6

Stationary Power Tools

POW-2013 Operating a Table Saw

Course Description

Understanding how to operate a table saw is useful in many industries. It is important for anyone operating a table saw to know how to make rip, crosscut, bevel, and miter cuts.

By the end of this course, you will be able to

- Make a rip cut
- Make a cross cut
- Make a bevel cut
- Make a miter cut

Estimated completion time (hours): 1.9

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PNEUMATIC SKILLS COURSES

Introduction to Pneumatics

PNE-1001 Introduction to Pneumatics

Course Description

Pneumatics is a technology that uses compressed air to make things move. Pneumatics has been used for thousands of years and has many industrial and commercial applications.

By the end of this course, you will be able to

- Define pneumatics
- Define compressed air
- List the advantages of compressed air
- Explain the importance of pneumatics in automation
- List industrial and commercial applications where pneumatics are used
- Explain the historical evolution of compressed air technology

Estimated completion time (hours): 1.3

Introduction to Pneumatics

PNE-1002 Pneumatic Systems

Course Description

Pneumatic systems are designed to efficiently produce, prepare, deliver, and use compressed air. As air travels through the system, it is compressed, cleaned, cooled, and treated before it is delivered to a mechanical device.

By the end of this course, you will be able to

- Define the pneumatic production system
- Define the pneumatic consumption system
- List the components of the production system
- List the components of the consumption system
- Explain the qualities of compressed air

Estimated completion time (hours): 1.3

Introduction to Pneumatics

PNE-1003 The Properties of Gases

Course Description

In a pneumatic system, compressed air is used to create work. Because compressed air is a gas, it is important to understand how gases behave with changes in pressure, temperature, and volume. There are a few fundamental laws of gases that will help you understand these relationships.

By the end of this course, you will be able to

- Define the three primary states of matter
- Explain how temperature affects the states of matter
- Explain the relationships between the pressure temperature and volume of a gas
- Define pressure
- Define flow
- Describe humidity and how it is measured
- Explain how all of these work together in a pneumatic system

Estimated completion time (hours): 1.8

Introduction to Pneumatics

PNE-1004 Air Compression and Distribution - Part One

Course Description

Delivering compressed air into industrial pneumatic devices requires a complex system with many important components. Each of these components plays an essential part in the production of the proper amount of quality compressed air.

By the end of this course, you will be able to

- Define the purpose of an air compressor
- Identify the different methods for air compression
- Explain how a positive displacement compressor compresses air
- Explain how a dynamic compressor compresses air
- Define the purpose of the air receiver
- Identify the elements of an air receiver

Estimated completion time (hours): 1.9

Introduction to Pneumatics

PNE-1005 Air Compression and Distribution - Part Two

Course Description

Compressing air produces heat, oil, and concentrated water. Before compressed air is distributed, it must be cooled, dried, and filtered. Once the compressed air is properly prepared, it is then distributed through an engineered network of pipes and fittings.

By the end of this course, you will be able to

- Explain the need for air dehydration
- List the devices used to remove water from the compressed air
- Define the need for air filtration
- List the types of air distribution systems
- List the materials used to construct a distribution system
- Explain the advantages of each system
- Explain how to size an air distribution system
- Define the primary types of air fittings

Estimated completion time (hours): 1.5

Components of a Pneumatic System

PNE-2001 Compressed Air Treatment

Course Description

Compressed air treatment is a process that includes filtering, lubricating, and regulating the pressure of the air. This process requires the use of several specialized devices.

By the end of this course, you will be able to

- Explain the need for compressed air treatment
- List the types of air treatments
- Explain the need for air filtration
- List the types of air filters
- Explain the need for air pressure regulation
- List the types of pressure regulators
- Explain the need for air lubrication
- List the types of air lubricators

Estimated completion time (hours): 1.4

Components of a Pneumatic System

PNE-2002 Pneumatic Actuators

Course Description

Pneumatic actuators use compressed air to create mechanical motion. They perform most of the work in an industrial automated system. There are thousands of configurations of actuators to perform any task you could imagine.

By the end of this course, you will be able to

- Define a pneumatic actuator
- List the primary types of pneumatic actuators
- Explain how a linear cylinder actuator works
- Explain how a rotary actuator works
- Describe the purpose of an air gripper

Estimated completion time (hours): 2.4

Components of a Pneumatic System

PNE-2003 Directional Control Valves

Course Description

Directional control valves are used to manage the flow of compressed air to and from the pneumatic devices. The use of directional control valves simplifies the job of controlling air flow to multiple pneumatic devices.

By the end of this course, you will be able to

- Explain the purpose of a directional control valve
- Demonstrate how a directional control valve works
- Understand the types of directional control valves
- Be able to classify directional control valves by their function and method of operation
- Be able to classify them by the manner in which they are actuated
- Identify the type of valve from a schematic symbol
- Explain the different types of valve actuation

Estimated completion time (hours): 1.8

Components of a Pneumatic System

PNE-2004 Vacuum Technology

Course Description

Vacuum is a technology used in an automated system to lift and move products and materials. Like pneumatics, vacuum technology is based upon some of the basic laws of science and physics, but with some differences.

By the end of this course, you will be able to

- Understand the physical laws that are used in vacuum technology
- Explain the importance of pressure when creating a vacuum
- Explain how a vacuum is generated
- List the types of vacuum
- Define the components that are used in a vacuum system
- Identify the symbols that are used for vacuum components

Estimated completion time (hours): 2.1

Components of a Pneumatic System

PNE-2005 Measuring Pneumatic Variables

Course Description

The behavior of a pneumatic system is controlled by the pneumatic variables of pressure and flow. Proper measurement and monitoring of these variables is critical to the performance of the pneumatic system.

By the end of this course, you will be able to

- Understand pressure
- Understand flow
- Define the instruments that are used to measure pressure and flow
- Explain how these instruments function
- Identify the units of measure for pressure and flow
- Explain the function of pressure and flow switches

Estimated completion time (hours): 1.3

Pneumatic Applications

PNE-3001 Pneumatic Applications

Course Description

There are countless applications of pneumatic technology in the world. Many of the applications share the same components and circuitry logic. In this course, you will learn how to build and operate several pneumatic and electro-pneumatic systems.

By the end of this course, you will be able to

- Draw basic electro-pneumatic circuits
- Assemble electro-pneumatic circuits
- Use pneumatic symbols to represent electro-pneumatic circuits
- Understand the basic logic of the electro-pneumatic circuits

Estimated completion time (hours): 1.8

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ROBOTICS SKILLS COURSES

Robotics

ROB-1001 Introduction to Robotics

Course Description

Robotics is the study of the design, construction, and operation of robots. Robots have become an integral part in the automation of many industries.

By the end of this course, you will be able to

- List common tasks of industrial robots
- Distinguish between the types of industrial robots
- Understand the history of industrial robots

Estimated completion time (hours): 1.1

Robotics

ROB-1002 Robot Safety

Course Description

Robots are used in many industrial applications. Every application presents both unique and common safety concerns. Understanding these safety concerns helps reduce the chance of injury to yourself and others.

By the end of this course, you will be able to

- Identify four types of accidents involving industrial robots
- Identify sources of hazards from an industrial robot
- Identify ANSI/RIA safety standards
- Identify PPE associated with robot operations

Estimated completion time (hours): 1.5

Robotics

ROB-2001 Robot Axes

Course Description

The manipulator of an articulated robot is capable of reaching any point within its maximum envelope from different directions. Understanding how these points are defined is important for anyone working with an articulated robot.

By the end of this course, you will be able to

- Identify the six common axes of an articulated robot
- List different coordinate systems
- Understand the differences between the coordinate systems
- Apply different coordinate systems to define the location of the same point

Estimated completion time (hours): 1.7

Robotics

ROB-2002 Robot Manipulator

Course Description

The manipulator is the component of the robot that performs the actual work of the system. Understanding the components and limitations of the manipulator is important for anyone working with a robot.

By the end of this course, you will be able to

- List types of actuators used on a manipulator
- Understand the term payload
- Understand the term armload
- List types of sensors used with a manipulator
- Define robot accuracy
- Define robot repeatability

Estimated completion time (hours): 1.3

Robotics

ROB-2003 Controller and End Effectors

Course Description

The robot controller and end effector are important components of the robot system. Identifying different end effectors and the components of the controller is important information for anyone working with robots.

By the end of this course, you will be able to

- Identify the different courses of a robot controller
- Identify the functions of each course of a robot controller
- List types of end effectors
- Identify functions that can be performed with the teach pendant

Estimated completion time (hours): 1.7

Robotics

ROB-2004 Robot Programs

Course Description

A robot requires a program to operate automatically. Understanding the required format, terms, and information of a robot program is important for many personnel working with a robot.

By the end of this course, you will be able to

- Understand the importance of syntax in a robot program
- List common data types
- List methods of repeating sections of a robot program
- Understand the importance of creating a plan to write a robot program
- Understand the difference between an instruction and an argument

Estimated completion time (hours): 1.3

Robotics

ROB-2005 Industrial Robot Applications

Course Description

Understanding the different applications an industrial robot may perform is important for anyone working with robots.

By the end of this course, you will be able to

- List welding processes performed by industrial robots
- List different types of arc welding
- Understand the factors affecting the quality of a friction weld
- List material handling applications for robots

Estimated completion time (hours): 1.2

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TOOL MAKING SKILLS COURSES

Tooling Capstone Project

TOL-3001 Need for Tools

Course Description

There are many circumstances that create the need for a new tool or modifying an old tool. Understanding the process of defining the need for a tool and the tool design process is important information for a toolmaker.

By the end of this course, you will be able to

- Understand the need for a new tool
- List some common sources of information for a toolmaker
- Understand the role of the tooling engineer in the making of a tool
- Understand the role of the toolmaker

Estimated completion time (hours): 0.8

Tooling Capstone Project

TOL-3002 The Process

Course Description

A toolmaker must decide on a series of steps, or process, to make a tool. Understanding the reasons behind a process is important information for anyone wanting to be a toolmaker.

By the end of this course, you will be able to

- Identify critical features of a tool
- Define removability
- Identify critical features or requirements on an engineering drawing

Estimated completion time (hours): 1.1

Tooling Capstone Project

TOL-3003 Permanent Assemblies

Course Description

Permanent assemblies are often used as components in tools. Understanding how to produce permanent assemblies is an important skill a toolmaker will acquire.

By the end of this course, you will be able to

- Define a permanent assembly
- Understand the process of making a permanent assembly with screws and dowel pins
- Understand the function of screws and dowel pins in a permanent assembly

Estimated completion time (hours): 1.4

Tooling Capstone Project

TOL-3004 Critical Features

Course Description

Creating critical features or satisfying critical requirements of a tool is usually the most difficult step in the tool making process. Understanding how this is accomplished is important for any toolmaker.

By the end of this course, you will be able to

- Understand the purpose of precision locators
- Understand how removability is attained in building a drill jig

Estimated completion time (hours): 1.0

Tooling Capstone Project

TOL-3005 Final Details

Course Description

Satisfying critical features and requirements of a tool often determines if a tool is functional. However, it is usually the small details of a tool that determine if the tool is user-friendly. Understanding how to make tools user-friendly is important for anyone wanting to become a toolmaker.

By the end of this course, you will be able to

- Understand how to layout a clamp for installation
- Understand the importance of deburring

Estimated completion time (hours): 1.2

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WELDING SKILLS COURSES

Welding Processes

WEL-2001 Introduction to Welding

Course Description

Welding is a common method of permanently joining metal components together. There are many processes and discontinuities associated with welding. There are also numerous symbols used to communicate the requirements of a weld.

By the end of this course, you will be able to

- List the basic arc welding process
- Identify joints and associated weld types
- Understand weld and welding symbols
- Identify weld discontinuities

Estimated completion time (hours): 1.6

Welding Defects

WEL-2002 Welding Defects

Course Description

Welding is a common method of permanently joining metal components together. There are many processes and discontinuities associated with welding. There are also numerous symbols used to communicate the requirements of a weld.

By the end of this course, you will be able to

- List the basic arc welding process
- Identify joints and associated weld types
- Understand weld and welding symbols
- Identify weld discontinuities

Estimated completion time (hours): 1.6

Welding for NDE Commercial

WEL-2003 Welding and Welding Discontinuities

Course Description

In this course, you'll learn about welding symbols, which provide a road map that helps a welder create the desired weld joints and weld types. You'll also learn about the different arc welding processes as well as the different types of weld discontinuities.

By the end of this course, you will be able to

- Explain the basic welding process
- Identify weld joints and weld types
- Understand welding symbols
- Describe arc welding processes
- Recognize weld discontinuities

Estimated completion time (hours): 0.9

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