



**SOUTH TEXAS  
COLLEGE**

Center for Advanced  
Training and Apprenticeships  
**Course Catalog**

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# Automation and Robotics

## Automation and Robotics Courses

### **Advanced Hydraulics**

Advanced study of hydraulic systems and components including diagnostics and testing of hydraulic systems.

- Test hydraulic circuits
- Use a systematic approach to troubleshooting
- Repair hydraulic systems

### **Basic Fluid Power (Pneumatics / Hydraulics)**

Basic fluid power course covering pneumatic and hydraulic systems, fluid power symbols, operating theory, components, and basic electrical and manual controls.

- Identify fluid power symbols
- Demonstrate knowledge of basic fluid power theory
- Demonstrate knowledge of component operation
- Generate basic fluid power circuits
- Demonstrate fluid power circuits using electrical and manual controls

### **DC-AC Circuits**

Fundamentals of DC circuits and AC circuits operation including Ohm's law, Kirchhoff's laws, networks, transformers, resonance, phasors, capacitive and inductive and circuit analysis techniques.

- Construct and analyze DC and AC circuits from simple to complex
- Perform test measurements
- Utilize a multimeter and oscilloscope to differentiate between two AC signals with respect to voltage, current, and power

### **Digital Systems**

A course in electronics covering digital systems. Emphasis on application and troubleshooting digital systems.

- Analyze and troubleshoot digital systems
- Discuss memory and storage
- Understand number systems, operations and codes

### **Fluid Power I (Hydraulics)**

Introduction to the basic principles of hydraulic pressure flow and system components. Emphasis on maintenance procedures, troubleshooting techniques, and safety practices.

- State Pascal's law and its consequences involving pressure
- Explain the continuity equation and its application to the flow rate

- Identify the basic hydraulic system component
- State the function of each component, calculate pressure, force flow and determine proper conductor size

### **Fluid Power II (Pneumatics)**

Introduction to the basic principles of pneumatic pressure, flow, and system components, symbols, and circuits. Emphasis on troubleshooting techniques, good maintenance procedures, and safety practices.

- State Pascal's Law and its consequences involving pressure
- Explain the general gas law and its applications
- Identify the basic pneumatic system components
- State the function of each component
- Calculate pressure, force and flow
- Determine compressor size given flow rate, pressure, and actuator requirements

### **Fundamentals of Electronics**

Applies concepts of electricity, electronics, and digital fundamentals; supports programs requiring a general knowledge of electronics.

- Build and test circuits using analog and digital components
- Visually identify components and component values
- Build and test series and parallel resistive circuits
- Check resistors, diodes, and transistors using a multimeter

### **Industrial Automation**

Electrical control systems, applications, and interfacing utilized in industrial automation.

- Apply advanced programming techniques utilizing programmable logic controllers
- Implement digital/analog interfacing schemes
- Explain the operation of communication and network methods
- Devise control system specifications
- Explain the operation and applications of distributed control systems

### **Industrial Maintenance Technology, Basic**

An introduction to preventive maintenance of equipment associated with general industrial production. Instruction in diagnosing and repairing hydraulic, pneumatic and mechanical systems related to industrial equipment.

- Define break-down, preventative and total productivity maintenance
- Develop a cost model of each type of maintenance
- Design a basic troubleshooting tree
- Solve basic AC and DC schematic problems
- Identify electrical inputs and expected outputs of basic industrial components
- Develop a flow chart for the operation of an air conditioning and/or refrigeration unit (AC/R)
- Identify expected pressures and temperatures for an AC/R unit

## **Introduction to Industrial Maintenance**

Basic mechanical skills and repair techniques common to most fields of industrial maintenance. Topics include precision measuring instruments and general safety rules common in industry, including lock-out/tag-out.

- Identify various types of fasteners common to industrial maintenance
- Utilize various hand and power tools
- Utilize precision measuring instruments
- Demonstrate proper lock-out/tag-out procedures

## **Introduction to Programmable Logic Controllers**

Basic hardware and software applications for industrial Programmable Logic Controllers (PLC). Includes power supplies, discrete Input/Output (IO) modules, programming devices, processors, basic logic elements, timers, and counters.

- List components contained within a typical PLC system
- Describe how different components work together to produce a functioning PLC system
- Describe characteristics of discrete devices
- Discuss operations and applications of basic programming elements
- Program ladder logic using basic elements to produce a time control for output device operation

## **Mechanical Maintenance**

General principles of mechanical and electrical systems related to inspection, repair, and preventative maintenance of facility equipment.

- Identify mechanical and electrical components
- Perform inspections, repairs, and preventative maintenance
- Distinguish between critical and non-critical equipment conditions

## **Microprocessor**

An introductory course in microprocessor software and hardware: architecture, timing sequence, operation, and programming. Discussion of appropriate software diagnostic language and tools.

- Define terms applicable to microprocessor/microcontroller systems
- Program applications for microprocessor/microcontroller systems
- Write a program to control microprocessor/microcontroller systems
- Describe the purpose of microprocessor internal registers

## **Programmable Logic Controllers I**

Fundamental concepts of programmable logic controllers, principles of operation, and numbering systems as applied to electrical controls.

- Identify and describe digital logic circuits and explain numbering systems
- Explain the operation of programmable logic controllers
- Convert ladder diagrams into programs
- Incorporate timers and counters utilizing programmable logic controllers
- Execute and evaluate programs

## **Programming for Discrete Electronic Devices**

Introduction to a high level programming language. Includes structured programming and problem solving applicable to discrete electronic devices.

- Use structured programming methods to develop and execute high-level language programs which solve technical problems

## **Robot Interfacing**

A study of the basic principles of robot controllers, controller input/output, memory, and interfacing with computer integrated manufacturing.

- Apply interfacing techniques on industrial robotic systems to enhance performance capacity
- Diagnose and solve issues encountered
- Identify system components

## **Robot Programming and Diagnostics**

Emphasis on the programming of industrial robots, the development of programming techniques, and the diagnosis of faults in systems.

- Describe the structure of robot programs
- Analyze and set-up input/output signals to interface with the robot program
- Develop a flowchart
- Write and install programs

## **Robotic Fundamentals**

An introduction to flexible automation. Topics include installation, repair, maintenance, and development of flexible robotic manufacturing systems.

- Describe the history of robotics and its impact on production and the labor force
- Define the term "robot" and describe general characteristics
- Explain the physics of robot motion and use different teaching pendants
- Describe the characteristics of different types of robot control systems, applications of robots, and end-of-arm tooling

## **Sensors**

Study of basic principles of industrial sensors for automated systems. Emphasis on the operation and application of position, rate, proximity, opto-electronics, ranging, and pressure switches.

- Demonstrate a working knowledge of sensors used in automation in industry
- Identify and describe the operation and application of positional and rate sensors, proximity sensors, temperature-sensing devices, pressure and strain gauges, and opto-electronic sensors
- Maintain, troubleshoot, repair, or replace sensors used on automated systems

## **Solid State Devices**

A study of diodes, transistor characteristics and other semiconductor devices, including analysis of static

and dynamic characteristics, biasing techniques, and thermal considerations.

- Analyze various solid state devices and circuits
- Construct circuits to test
- Troubleshoot various solid state devices

# Business/Management

## Business/Management: Business Skills

### **Beginning Bookkeeping**

Focus on analyzing, classifying, and recording business transactions. Emphasizes understanding of complete accounting cycle and preparing financial statements, bank reconciliations, and payroll.

- Analyze and record business transactions
- Prepare basic financial statements for a service business
- Prepare a bank reconciliation and related journal entries
- Complete a payroll register and maintain related personnel records

### **Computerized Accounting I**

An introduction to the accounting cycle in a computerized environment.

- Identify procedures to complete a computerized accounting cycle
- Perform initial installation and start-up procedures
- Record and correct journal entries
- Perform adjusting and closing procedures
- Display and print reports and financial statements

### **Intermediate Computerized Accounting**

A continued study of using the computer to maintain accounting records with emphasis on accounts receivable.

- Identify the various input forms required in a computerized accounts receivable system
- Comply with internal controls and security procedures
- Generate invoices and appropriate reports

### **Introduction to Accounting I**

A study of analyzing, classifying, and recording business transactions in a manual and computerized environment. Emphasis on understanding the complete accounting cycle and preparing financial statements, bank reconciliations, and payroll.

- Define accounting terminology
- Analyze and record business transactions in a manual and computerized environment
- Complete the accounting cycle
- Prepare financial statements

- Apply accounting concepts related to cash and payroll
- Prepare bank reconciliations
- Correct accounting errors

## **Introduction to Accounting II**

A study of accounting for merchandising, notes payable, notes receivable, valuation of receivables and equipment, and valuation of inventories in a manual and computerized environment.

- Define accounting terminology
- Analyze and record business transactions for a merchandising operation in a manual and computerized environment
- Calculate interest
- Apply valuation methods for receivables and payables
- Utilize various inventory and depreciation methods
- Identify internal control procedures for inventory, receivables, and payables

## **Introduction to Computerized Accounting**

Introduction to utilizing the computer in maintaining accounting records with primary emphasis on a general ledger package.

- Utilize an application software to perform accounting tasks
- Maintain records
- Prepare reports
- Analyze reports for a business entity
- Complete a comprehensive project
- Explain the components of general ledger software

## **Introductory Presentation Techniques**

Presentation techniques for presenting ideas and information to business and industry including the use of visual aids.

- Demonstrate a business/industry presentation with visual aids
- Discuss audience research
- Discuss presentation software

## **Managerial Accounting**

Practical applications of accounting with emphasis on cost behavior, capital management decisions, budgeting, and financial statement analysis.

- Apply accounting concepts to analyze and interpret information for management decision-making
- Discuss operational budgeting and planning
- Discuss cost control

## **Marketing**

The marketing process including the role of the consumer, development of products and services, analysis



of market forces, and determination of pricing, distribution and promotion.

- Identify the product, distribution, pricing and promotion used in the marketing process in relationship to customer needs
- Identification of consumer and organizational needs
- Discuss the marketing plan

## **Business/Management: Computer Skills**

### **Advanced MS Excel**

Advanced concepts in electronic spreadsheets. Topics address macro programming features, database functions, merging/linking spreadsheets, data file transfer, and Boolean functions.

- Utilize advanced spreadsheet functions
- Create and design macros
- Develop solutions utilizing linked worksheets and merged data

### **Advanced MS PowerPoint**

Techniques for developing and modifying multimedia presentations and creating interactive slide shows.

- Utilize advanced multimedia functions to insert and modify visual elements
- Integrate information with other programs
- Create interactive slide shows
- Utilization of multimedia web and collaboration features

### **Basic Keyboarding**

Skill development in keyboarding.

- Demonstrate basic keyboarding techniques
- Development of acceptable speed and accuracy levels
- Demonstrate formatting of basic documents

### **Data Entry Skill Development**

Computer 10-key with mathematical calculations based on business applications. Emphasizes speed and accuracy.

- Demonstrate correct hand position and fingering for data entry
- Apply numerical and alpha-numerical data entry skills
- Perform calculations based on business applications

### **Intermediate MS Excel I**

Instruction in moving and copying, cell contents; sorting mathematical, statistical, and financial functions; date and time arithmetic; report generation; and built-in graphics support.

- Create macros
- Utilize database features
- Apply data analysis features
- Utilize linked worksheets

## **Intermediate MS Excel II**

Techniques for customizing the spreadsheet environment by analyzing workbook data and creating worksheets and charts.

- Import and export data
- Manage workbooks
- Format data
- Establish ranges
- Customize spreadsheets
- Audit worksheets
- Summarize data
- Analyze data
- Apply workgroup collaborative features

## **Introduction to Computers**

Overview of computer information systems. Introduces computer hardware, software, procedures, and human resources.

- Identify the components of a computer system
- Use common applications
- Explain the impact of computers on society
- Identify computer careers
- Identify fundamental programming structures
- Identify ethical use of computers
- Use basic operating system functions

## **Introduction to MS Access**

Introduction to database theory and the practical applications of a database.

- Identify database terminology and concepts
- Plan, define, and design a database
- Design and generate tables, forms, and reports
- Devise and process queries

## **Introduction to MS Excel**

Instruction in the concepts, procedures, and application of electronic spreadsheets.

- Define spreadsheet terminology and concepts
- Create formulas and functions, use formatting features
- Generate charts, graphs, and reports

## **Introduction to MS Word**

An overview of the production of documents, tables, and graphics.

- Identify word processing terminology and concepts
- Create technical documents

- Format and edit documents
- Use simple tools and utilities
- Print documents

### **Introduction to PC Operating Systems**

Introduction to personal computer operating systems including installation, configuration, file management, memory and storage management, control of peripheral devices, and use of utilities.

- Install, configure, and maintain the operating system
- Perform basic file management operations
- Organize and allocate primary and secondary storage
- Access and control peripheral devices
- Run utilities

### **Introduction to PowerPoint**

Instruction in the utilization of presentation software to produce multimedia presentations. Graphics, text, sound, animation and/or video may be used in presentation development.

- Identify presentation media terminology and concepts
- Create presentations using text, visual and/or sound elements
- Use effective compositions and style
- Prepare presentations for distribution on computers or other media
- Modify sequence and slide master

## **Business/Management: Management Skills**

### **Basic Workplace Communication**

Designed to be repeated with varying content. Skill development in pronunciation and use of job-related vocabulary. Includes non-verbal communication techniques.

- Articulate accurate pronunciation of American English sound systems in job-related contexts
- Identify words and phrases commonly mispronounced
- Use eye-contact and tonal inflection to communicate clearly in the workplace

### **Business Ethics**

Discussion of ethical issues, the development of a moral frame of reference, and the need for an awareness of social responsibility in management practices and business activities. Includes ethical corporate responsibility.

- Define business ethics
- Identify the consequences of unethical business practices
- Describe reasoning for analyzing ethical dilemmas
- Describe different ethical views
- Explain how business, government, and society function interactively
- Explain corporate social responsibility

## **Change Management**

Knowledge, skills, and tools that enable a leader/organization to facilitate change in a participative style.

- Explain the roles of change agent and champion within the organization
- Explain the progression of change from introduction to completion
- Examine barriers to successful implementation
- Demonstrate ability to analyze internal and external environments as well as stakeholder issues in showing need for change

## **Communication Skills for the Workplace**

Addresses essential listening, speaking, reading, writing, and computational skills required by business and industry. Improvement of communication skills related to successful job performance.

- Differentiate between appropriate and inappropriate examples of listening, speaking, reading, writing, and computational skills
- Demonstrate listening, speaking, reading, writing, and computational skills required by business and industry
- Demonstrate an understanding of verbal and nonverbal communication skills

## **Communications Improvement I**

Designed for students whose primary language is other than English. Presentation of industry-related basic reading, writing, speaking, and listening skills. Emphasis on high-frequency vocabulary and phonics; refining oral and written production and listening skills for enhanced job productivity; and increasing control of the English sound system.

- Paraphrase job-related forms and dialogs
- Articulate basic phonic generalizations and high frequency vocabulary
- Apply basic grammar skills

## **Communications Improvement II**

Provides on-the-job dynamic communicative practice for students whose primary language is other than English, and introduces students to the uses of language in a variety of relevant job-related contexts.

- Match job-related vocabulary words with their respective definitions
- Cite examples of the pronunciation, meaning, and part of speech of vocabulary words that relate to a specific industry
- Summarize the main idea and supporting details of brief job-related listening comprehension passages
- Infer the main idea of selected job-related comprehension passages

## **Communications Improvement III**

Designed for students whose primary language is other than English. Improvement in reading, writing, speaking and listening skills for job success. Focus on recognition and comprehension of analogies, antonyms, synonyms, and context clues. Interpretation of factual material and inferences associated with job-related communication.

- Match selected job-related vocabulary terms with their respective definitions

- Match analogies, antonyms, and synonyms encountered in a specific industry with their respective definitions
- Using context clues, explain the meaning of words and phrases
- Summarize job-related passages that are more than one paragraph

### **Communications Improvement IV**

Designed for students whose primary language is other than English. Emphasis on industry-related vocabulary development and skills acquisition, including determining meaning from context, identifying word forms and variation in meaning, synonyms and antonyms, connotation and denotation, and fact and opinion.

- Select the correct meaning of industrial and job-related terms based on context
- Label industry-related examples of synonyms versus antonyms, connotation versus denotation, and fact versus opinion
- Summarize paragraphs and longer passages
- Explain the relationships between main ideas and supporting details in business-related passages

### **Communications Improvement V**

Designed for students whose primary language is other than English. Focus on comprehending challenging industrial and job-related materials. Exploration of various reference sources and practice suggested proofreading techniques to assist with on-the-job document production.

- Use a dictionary and other resources to answer questions about spelling, syllabication, pronunciation, parts of speech, and definitions
- Identify ways to improve spelling and the use of words that are commonly confused or misused
- Select appropriate synonyms for words or ideas
- Apply proofreading procedures in comparing documents
- Use proofreaders' marks to identify changes in the text
- Explain the relationships between main ideas and supporting details in business-related passages

### **Communications Improvement VI**

Focuses on communication situations found in business and the workplace for students whose primary language is other than English. Emphasizes internal communication with employees and external communication with customers, clients, and suppliers. Covers problem-solving and decision-making communications; and business etiquette.

- Identify various communication styles
- Describe communication barriers
- Demonstrate effective customer service communication techniques
- Use effective business etiquette

### **Communications in Management**

Basic theory and processes of communication skills necessary for the management of an organization's

workforce.

- Explain the communication process
- Create solutions to major communication barriers
- Describe how communication contributes to effective management

### **Critical Thinking and Problem Solving**

Interpreting data for problem solving and recommending corrective action. Emphasis on a structured approach to critical thinking and problem solving in a team environment.

- Describe analytical and systems-based problem-solving tools and methods to improve performance
- Apply problem solving tools to business processes
- Write, present, and defend project recommendations

### **Delegation**

Concepts of delegation and empowerment of employees and teams. Prepares the student to delegate effectively and to foster a mind-set of empowerment in employees.

- Describe factors to consider when delegating a task
- Develop a strategy for effective delegation
- Outline the steps for effective empowerment
- Identify different types of authority

### **Diversity in the Workplace**

The impact of diversity on individual and organizational performance.

- Identify aspects of diversity
- Distinguish between bias, stereotyping, and discrimination
- Describe how individual differences impact performance and organizational outcomes
- Outline techniques that improve interaction and organizational effectiveness

### **Effective Public Speaking**

Speaking publicly without stress. Emphasizes use of verbal and non-verbal skills to make points clear and effective.

- Implement strategies for stress-free public speaking
- Use verbal and non-verbal communication skills to make points clear
- Organize presentation for understanding and clarity
- Present to an audience

### **Employee Relations**

An examination of policies, practices, and issues required to build strong employee relations. Topics include communications, employee conduct rules, performance appraisal methods, Title VII, Family Medical Leave Act, Fair Labor Standards Act, and Americans with Disabilities Act updates.

- Identify key legislation affecting the employee relations function of human resource management

- Define the role of employee relations as it relates to organizational effectiveness
- Understand performance appraisal methods

### **Employee Training and Development**

Explores theories and techniques for training and developing employees.

- Identify the types of learners and methods to address different learning styles
- Differentiate between mentoring, coaching, and counseling
- List the steps in creating a training plan

### **Employment Law**

Overview of laws and legal issues related to employment practice. This course was designed to be repeated multiple times if content varies.

- Describe legal issues in employment practice
- Identify laws related to employment practice
- Discuss Equal Employment Opportunity (EEO)

### **Employment Practices**

A study of employment issues including techniques for human resource forecasting, selection, and placement including interview techniques, pre-employment testing and other predictors. Topics include recruitment methods, the selection process, Equal Employment Opportunity (EEO), EEO recordkeeping, and Affirmative Action Plans.

- Identify key legislation affecting the employment functions of human resource management
- Establish a recruitment plan
- Define job requisitions by matching skills to needed competencies
- Develop an employment policy related to recruitment and selection
- Develop selection tools

### **Enhancing Workplace Communication**

Focuses on the principles of communication to facilitate sending and receiving messages in the workplace.

- Identify personality types
- Describe elements of communication
- Demonstrate communication skills
- Compare and contrast effective and ineffective communication

### **Financial Management**

Examination of accounting information to support managerial decision-making processes. Topics include managerial concepts and systems, various analyses for decision making, and planning and control.

- Examine how internal controls affect cost and budgeting
- Analyze profit and loss statements
- Solve financial problems
- Utilize formulas to determine an organization's financial condition

## **Fundamentals of Management**

Management functions, and decision-making processes including planning, organizing, leading, staffing, and controlling.

- Describe management functions
- Describe decision-making process
- Solve problems according to contemporary management processes

## **Human Resources Training and Development**

An overview of human resources training and development as related to organizational mission and goals.

- List organizational advantages of human resources development policies
- Describe how training and development strategies are linked to organizational goals
- Identify methods of measuring training needs
- Identify components of training design and delivery
- Describe methods of evaluating a training program

## **Information and Project Management**

Critical path methods for planning and controlling projects. Includes time/cost tradeoffs, resource utilization, stochastic considerations, task determination, time management, scheduling management, status reports, budget management, customer service, professional attitude, and project supervision.

- Identify project tasks; sequence project activities
- Estimate the duration of project activities
- Identify interdependencies
- Demonstrate means to coordinate change across a project

## **Introduction to Project Management**

Methods for planning and controlling projects. Includes project management concepts and models, critical path, analysis of time/cost benefits, and resource utilization.

- Define project management compared to general management
- Describe the phases of the project life cycle
- Define the roles of the project manager and the project team
- Define deliverables and stakeholders
- Identify project management resources

## **Introduction to Supervision**

Supervisory tasks, leadership and motivational skills, communication processes, organizational design, and effective solution strategies.

- Explain supervision and leadership styles
- Explain motivational techniques
- Cite examples of how motivational techniques can be used by a supervisor
- Explain elements of the communication process and the guidelines for organizational design
- Apply managerial terminology



## **Level I- Basic Supervision**

Exploration of supervisory functions as applied to leadership, counseling, motivation and human skills.

- Explain the role, characteristics, and skills of a supervisor
- Explain the counseling process
- Understand motivation and human skills

## **Level II- Leadership Skills for Supervisors/Managers**

Concepts and skills of leadership in the work setting. Introduces leadership and motivational theories and leadership styles. Includes evaluation of leadership performance.

- Describe leadership styles
- Apply leadership theories
- Demonstrate communication strategies

## **Management and Labor Relations**

The development and structure of the labor movement and its impact on business and society.

- Describe the history and development of the labor movement and related legislation
- Explain the impact of unions in management and labor relations
- Explain the process of collective bargaining, contract negotiation, contract administration, and grievances
- Identify management's ethical, social, and legal responsibilities in labor/management relations
- Analyze various labor/management disputes

## **Occupational Communication Improvement**

Designed to be repeated with varying content for speakers of languages other than English, exposing students to the uses of language in industry-specific, job-related contexts.

- Paraphrase industry-specific, job-related correspondence and dialog
- Match job-related vocabulary with their definitions
- Articulate correct pronunciation and definition of a word or phrase relating to a specific industry

## **Organizational Behavior**

The analysis and application of organizational theory, group dynamics, motivation theory, leadership concepts, and the integration of interdisciplinary concepts from the behavioral sciences.

- Explain organizational theory as it relates to management practices, employee relations, and structure of the organization to fits its environment and operation
- Analyze leadership styles and determine their effectiveness in employee situations
- Identify methods in resolving organizational problems
- Describe the impact of corporate culture on employee behavior
- Analyze team dynamics, team building strategies, and cultural diversity

## **Principles of Management**

Concepts, terminology, principles, theories, and issues in the field of management.

- Explain various theories, processes, and functions of management
- Apply theories to a business environment
- Identify leadership roles in organizations
- Describe elements of the communication process

### **Problem Solving and Decision Making**

Decision-making and problem-solving processes in organizations utilizing logical and creative problem-solving techniques. Application of theory is provided by experiential activities using managerial decision tools.

- Identify individual, group, and organizational decision-making processes
- Write, present, and defend project recommendations
- Apply process to solving problems using managerial decision tools and critical-thinking skills

### **Supervision**

- The role of the supervisor. Includes managerial functions as applied to leadership, counseling, motivation, and human relations skills.
- Explain the role, characteristics, and skills of a supervisor
- Identify the principles of management at the supervisory level
- Explain the human relations skills necessary for supervision
- Explain motivational techniques
- Cite examples of how motivational techniques can be used by a supervisor in a working environment

### **Team Building**

Principles of building and sustaining teams in organizations. Includes team dynamics, process improvement, trust and collaboration, conflict resolution, and the role of the individual in the team.

- Describe the principles and processes of team building
- Identify interpersonal skills, group dynamics, and team leadership
- Demonstrate techniques for team problem-solving and conflict resolution

### **Teams and Consensus Building**

An examination of group dynamics, trust and collaboration and their role in building positive and productive work groups. Discussion of team stress and distress, ways of working effectively as a team, and methods for incorporating team building strategies in staff meetings, professional development activities, and one-on-one counseling.

- Describe basic team development theories and concepts
- Demonstrate characteristics of an effective team
- Identify personality styles and their impact on an effective team
- Identify five common barriers to team development
- Demonstrate professional management tools

## **Workplace Communications**

Communication skills as applicable to individuals or groups in the workplace. Includes skills in listening, writing, and verbal/non-verbal communications.

- Identify communication styles
- Demonstrate listening, writing
- Demonstrate verbal/non-verbal communication skills

# **Electrical/HVAC**

## **Electrical/HVAC: Electrical**

### **AC Circuits**

A study of the fundamentals of alternating current including series and parallel AC circuits, phasors, capacitive and inductive networks, transformers, and resonance.

- Operate test equipment; identify various sources of electricity in alternating (AC) circuits
- Analyze AC circuits using applicable mathematical formulas
- Troubleshoot various AC circuits using schematic diagrams

### **Basic Electrical Theory**

Basic theory and practice of electrical circuits. Includes calculations as applied to alternating and direct current.

- Explain atomic structure and basic values such as voltage, current, resistance, and power
- Determine electrical values for combination circuits in direct current (DC) and alternating current (AC) containing resistance, inductance, and capacitance
- Summarize the principles of magnetism
- Calculate voltage drop based on conductor length, type of material, and size
- Utilize electrical measuring instruments

### **Basic Electrical Wiring**

Presentation of the theory of residential electric circuits. Topics include load calculations and safety in electrical work, installation of wiring, load protection, ground fault, and other devices commonly used in 110-volt household applications.

- Compute the circuit sizes needed for the installation of branch circuits, feeders, and service entrance conductors
- Explain the proper installation of wiring devices according to National Electrical Code (NEC)
- Demonstrate grounding methods
- Install ground fault circuits

### **Basic Industrial Electricity**

Theory and application of electrical energy with emphasis on industrial and commercial systems. Includes AC and DC theory, electrical generation, transmission, distribution and switching and single phase and

three phase motor principles.

- Describe electrical distribution networks
- Identify electrical power components
- Discuss basic Electrical Safety

## **DC Circuits**

A study of the fundamentals of direct current including Ohm's law, Kirchhoff's laws and circuit analysis techniques.

- Apply safety techniques while working on and troubleshooting various circuits and components
- Interpret color codes and other descriptors used in electronics
- Identify various sources of electricity in DC circuits
- Interpret characteristics of voltage, current, resistance, and power in DC circuits
- Measure voltage, current, and resistance in DC circuits using measuring devices

## **Electric Motors**

DC and AC motors. Emphasis on the theory of magnetism, motors, and principles of operation. Includes operating characteristics, application, selection, installation, maintenance, and troubleshooting. Includes NEC guidelines covering installation of electrical motors.

- Describe the primary differences between AC and DC motors and list the advantages of each
- Using NEC tables for a given motor, determine the correct overload for the motor starter
- Demonstrate connection and operation of a multi-phase motor, for both high and low voltage operation
- Demonstrate connection and operation of other motors as directed

## **Electrical Circuits**

Introduction to AC and DC currents, transformers, RLC circuits, resonance, power in AC and DC circuits, mathematics used in analysis of AC and DC circuits, and basic amplifying systems and power supplies.

- Perform mathematical analysis of electrical circuits and electrical distribution
- Describe a series, parallel, and combination circuit
- Describe the components in a circuit

## **Electrical Theory and Devices**

Electrical and electronic measuring devices and their applications to the use of electrical power. Includes calculating and balancing single-phase and three-phase systems.

- Define phasor and show how to represent a phasor in rectangular form and in polar form
- Convert between rectangular and polar forms
- Graphically depict the relationship of true power, reactive power, and apparent power before and after power factor correction
- Measure and calculate power and the power factor in three-phase systems
- Measure power in a three-phase system using the One Wattmeter Method and the Two Wattmeter Method

## **Electrical Troubleshooting**

Maintenance, operation, troubleshooting, and repair of circuits of various residential, commercial, and industrial electrical systems.

- Use multimeters to perform tests on electrical equipment
- Discuss various types of circuits and electrical systems
- Demonstrate the proper way to test transformers and motors
- Identify a short circuit, open circuit, and a closed circuit
- Troubleshoot electric motors and control circuits

## **Electricity Principles**

Principles of electricity including proper use of test equipment, A/C and D/C circuits, and component theory and operations.

- Identify basic principles of electricity (A/C and D/C), voltage, current, and circuitry
- Apply Ohm's law to electrical calculations
- Use test equipment to measure continuity, voltage, and current values
- Use electrical safety practices

## **Electro-Mechanical Devices**

A study of electro-mechanical devices found in robotic systems. Includes transformers, switches, and solid-state relays.

- Install wiring for electro-mechanical applications
- Analyze transformer applications
- Troubleshoot related electrical components found in automated systems

## **Electronic Soldering**

Theory and use of tools and equipment for electronic soldering techniques.

- Demonstrate soldering
- Demonstrate desoldering techniques
- Practice safety procedures

## **EPA Recovery Certification Preparation**

Certification training for HVAC refrigerant recovery, recycle, and reclaim. Instruction will provide a review of EPA guidelines for refrigerant recovery and recycling during the installation, service, and repair of all HVAC and refrigeration systems.

- Define refrigerant recovery, recycle, and reclaim terms
- Explain refrigerant recovery, recycle, and reclaim procedures
- Analyze refrigerant recovery, recycle, and reclaim operations
- Identify Type I, Type II, and Type III appliances
- Examine and utilize Section 608 of the Clean Air Act of 1990 Refrigerant, Recovery, Recycle, and Reclaim

## **Introduction to Electrical Controls**

General principles of electrical controls and their components in the electrical power industry. Includes reading electrical diagrams and identifying industrial switches and pilot devices. Introduction to hardwiring and troubleshooting of industrial control relays and timers.

- Identify terms and devices used in electrical circuits and controls
- Read and interpret schematic diagrams using industrial switches, pilot devices, control relays, and timers
- Setup and hardwire circuits using control relays and timers
- Analyze characteristics and differentiate between on and off delay timers

## **Soldering Techniques**

Hands-on course for electronic soldering techniques.

- Use appropriate soldering tools and equipment
- Demonstrate proper soldering techniques
- Demonstrate safety procedures

# **Electrical/HVAC: HVAC**

## **Advanced Air Conditioning Controls**

Theory and application of electrical control devices, electromechanical controls, and/or pneumatic controls.

- Install and troubleshoot complex electrical control devices
- Control circuits; apply A/C control concepts
- Analyze the effects of smart energy networks and how they interface with HVAC control systems

## **Advanced Electricity for HVAC**

Advanced electrical instruction and skill building in installation and servicing of air conditioning and refrigeration equipment including detailed instruction in motors and power distribution motors, motor controls, and application of solid-state devices.

- Apply the principles and theory of power distribution
- Describe the theory, operation, and protection of electric motors
- Identify the application of solid-state devices
- Troubleshoot electric motors and controls

## **Air Conditioning and Refrigeration Codes**

HVAC standards and concepts with emphasis on the understanding, and documentation of the codes and regulations required for the state mechanical contractors license and local codes.

- Demonstrate the ability to locate and identify information in code books
- Demonstrate the ability to locate reference materials applicable to installation procedures governed by Texas Department of Licensing and Regulation (TDLR)

## **Air Conditioning Control Principles**

A basic study of HVAC and refrigeration controls; troubleshooting of control components; emphasis on use of wiring diagrams to analyze high and low voltage circuits; a review of Ohm's law as applied to air conditioning controls and circuits.

- Test, repair, and/or replace HVAC-related electrical and control components, wiring and equipment
- Read, draw, and interpret high and low voltage control circuits
- Use of wiring diagrams to analyze high and low voltage circuits

## **Air Conditioning I**

Introduction to HVAC principles, terminology, tools, and skills.

- Perform trade mathematical operations
- Identify and use HVAC tools
- Identify and use copper, plastic, and ferrous metal piping techniques
- Perform brazing and soldering operations
- Explain electrical and HVAC principles

## **Air Conditioning II**

Study and practical application of air conditioning principles, including air properties, maintenance operations, thermodynamics, and compressors.

- Measure AC and DC electrical circuits, air properties and distribution
- Demonstrate maintenance procedures of typical HVAC equipment
- Perform refrigerant leak detection, evacuation, recovery, and charging

## **Air Conditioning Installation and Startup**

A study of air conditioning system installation, refrigerant piping, condensate disposal, and air cleaning equipment with emphasis on startup and performance testing.

- Install air conditioning equipment and evaluate system performance
- Demonstrate disposal and recycling of materials, including refrigerants and mercury
- Demonstrate bending and cutting technique for system piping
- Install equipment and ductwork according to industry standards to maximize efficiency

## **Air Conditioning Troubleshooting**

An advanced course in application of troubleshooting principles and use of test instruments to diagnose air conditioning and refrigeration components and system problems including conducting performance tests.

- Test and diagnose components, systems, and accessories
- Complete applicable documentation
- Review of basic refrigeration cycle

## **Basic Air Conditioning**

Heating, ventilation, and air conditioning theory. Includes testing, and repair. Emphasizes refrigerant

reclamation, safety procedures, specialized tools, and repairs.

- Analyze heating, ventilation, and air conditioning systems
- Utilize specialized tools
- Repair or replace components

### **Basic Electricity for HVAC**

Principles of electricity as required by HVAC, including proper use of test equipment, electrical circuits, and component theory and operation.

- Demonstrate knowledge of basic principles of electricity, electrical current, circuitry, and air conditioning devices
- Apply Ohm's law to electrical calculations
- Perform electrical continuity, voltage, and current tests with appropriate meters
- Demonstrate electrical safety

### **Commercial Air Conditioning**

A study of components, applications, and installation of air conditioning systems with capacities of 25 tons or less.

- Apply and describe the sequence of operation for commercial air conditioning systems and their accessories
- Identify components relative to commercial air conditioning
- Explain energy efficient and renewable energy technologies

### **Commercial Air Conditioning System Design**

Advanced study in essential elements of commercial air conditioning contracting including duct systems design; equipment selection using manufacturers' data; and preparation of shop drawings and submittals.

- Calculate heat loss and heat gain
- Read and interpret detailed HVAC design specifications and plans
- Design a complete air distribution system
- Size heating and cooling equipment to the structure
- Perform a load calculation using industry standards

### **Commercial Refrigeration**

Theory and practical application in the maintenance of commercial refrigeration; medium, and low temperature applications and ice machines.

- Explain and apply medium and low temperature systems operation
- Explain and apply ice machine and packaged refrigeration system operation
- Explain application and conversion procedures of refrigerants related to specific systems

### **Gas and Electric Heating**

Study of the procedures and principles used in servicing heating systems including gas fired furnaces and electric heating systems.

- Identify different types of gas furnaces



- Identify and describe component operation of gas furnaces
- Service and troubleshoot gas furnaces
- Perform safety inspections on gas and electric heating systems
- Identify unsafe operation of gas furnaces
- Identify and discuss component operation of electric heating systems
- Service and troubleshoot electric heating systems.

### **Heat Pumps**

A study of heat pumps, heat pump control circuits, defrost controls, auxiliary heat, air flow, and other topics related to heat pump systems.

- Explain a reverse cycle system
- List the mechanical and electrical components for the heat pump operation
- Explain the operation of heat pump modes including cooling, heating, defrost, emergency heat, and auxiliary heat mode
- Identify and explain different methods of accomplishing defrost
- Charge a system correctly in the heating and cooling mode
- Troubleshoot electrical and mechanical components
- Perform tests for adequate air flow
- Determine balance point and coefficient of performance (C.O.P)
- Define attributes of geothermal heat pump systems

### **HVAC Maintenance Skills**

An introduction to routine maintenance and minor repairs on residential and light commercial heating, ventilation, and air conditioning systems. Inspection of gas/electrical lines, cleaning systems and filter replacement, lighting pilots, lubrication, and replacement of belts. Instruction in the laws and restrictions involving service to central units.

- Inspect residential and light commercial heating, ventilation, and air conditioning systems
- Perform routine maintenance and minor repairs on residential and light commercial heating, ventilation, and air conditioning systems
- Inspect gas/electrical lines
- Discuss laws and restrictions of central unit service

### **HVAC Shop Practices and Tools**

Tools and instruments used in the HVAC industry. Includes proper application, use and care of these tools, and tubing and piping practices.

- Demonstrate use of hand tools, power tools, and instruments
- Construct flares, swages, and bends using tubing tools
- Use a torch for brazing and soldering
- Identify industry safety, and environmental regulations
- Perform safety procedures

## **HVAC Zone Controls**

Theory and application of HVAC residential Zone control devices, electromechanical controls, and/or pneumatic controls.

- Define a zone control system
- Perform the installation of zone control in an existing home
- Define the major components of a zone control system
- State the primary benefits of a zone control system

## **Industrial Air Conditioning**

A study of components, accessories, applications, and installation of air conditioning systems above 25 tons capacity.

- Explain the sequence of operation for industrial systems and its accessories
- Identify components relative to industrial systems including chilled water systems
- Troubleshoot systems
- Perform program maintenance procedures

## **Refrigeration Principles**

An introduction to the refrigeration cycle, heat transfer theory, temperature/pressure relationship, refrigerant handling, refrigeration components, and safety.

- Identify refrigeration components
- Explain operation of the basic refrigeration cycle and heat transfer
- Demonstrate proper application and/or use of tools, test equipment, and safety procedures

## **Residential Air Conditioning**

A study of components, applications, and installation of mechanical air conditioning systems including operating conditions, troubleshooting, repair, and charging of air conditioning systems.

- Identify various types of system applications
- Perform charging, recovery, and evacuation procedures of an installed system
- Perform component and part diagnostics and replacement
- Perform system maintenance

## **Residential Air Conditioning Systems Design**

Study of the properties of air and results of cooling, heating, humidifying or dehumidifying; heat gain and heat loss calculations including equipment selection and balancing the air system.

- Calculate heat loss and heat gain
- Size heating and cooling equipment to the structure
- Read and interpret detailed HVAC design plans
- Perform a load calculation using industry standards
- Design a complete air distribution system including ventilations requirements and indoor air quality

## **Testing, Adjusting, and Balancing HVAC Systems**

A study in the process of checking and adjusting all the building environmental systems to produce the design objectives. Emphasis on efficiency and energy savings.

- Interpret HVAC design specifications and plans
- Measure air flow, water flow, and system pressure with instruments
- Perform calculations for fan and pump laws including psychometrics
- Adjust and align mechanical equipment
- Diagnose malfunctioning equipment and create a punch list
- Test air quality, humidity, noise, and temperature

# **Manufacturing**

## **Manufacturing: Advanced Manufacturing Technology**

### **Basic Blueprint Reading**

Emphasis on accurate/efficient interpretation of symbols/graphic language required to produce working drawings

- Interpret sketches and working drawings conforming to standard drafting practices
- Correlate elevations, sections, details, plan views, schedules, and general notes
- Scale prints with architectural and engineering scales

### **Basic Lathe**

An introduction to the common types of lathes. Emphasis on basic parts, nomenclature, lathe operations, safety, machine mathematics, blueprint reading, and theory.

- Identify engine lathe components
- Match cutting speeds and feeds to materials
- List safety procedures
- Identify machine accessories
- Identify types of lathes
- Use formulas to calculate speeds and feeds
- Set up basic lathe operations
- Perform metal removing operations such as turning, facing, drilling, grooving, turning on centers, and threading
- Perform basic machine maintenance

### **Basic Machine Shop I**

A course that introduces the student to machining fundamentals. The student will use basic machine tools including the lathe, milling machine, drill press, power saw, and bench grinder. Machine terminology, theory, math, part layout, and bench work using common measuring tools is included. Emphasis is placed on shop safety, housekeeping, and preventative maintenance.

- Demonstrate set-up and use of the lathe, milling machine, drill press, power saw, and bench grinder applying good housekeeping, and proper safety
- Use precision instruments to perform bench work including part layout, drilling, reaming, tapping, press fitting, location of hole centers and surfaces
- Set up power saws for cutoff operation
- Demonstrate tooling maintenance, and hazardous material handling
- Perform preventative maintenance
- Interpret blueprints

### **Basic Milling Operations**

An introduction to the common types of milling machines, part nomenclature, basic machine operations and procedures, safety, machine mathematics, blueprint reading, and theory.

- Identify milling machine components and their functions
- Identify types of milling machines
- Describe the difference between climb and conventional milling
- Calculate speeds and feeds for milling machines
- Set up milling machines
- Operate milling machines

### **Basic Millwright**

Introduction to the millwright trade. Study of common millwright tools and fasteners. Development of skills in basic layout procedures, gasket making and installation, and oxygen/fuel cutting. Emphasis on safety in the accomplishment of these activities.

- Identify common millwright tools and fasteners
- Perform layout procedures
- Perform gasket making including gasket installation
- Perform oxygen fuel cutting
- Follow and maintain safety in each activity

### **Beginning Machine Shop**

Fundamental machine shop safety, math, and measurement.

- Discuss the proper use of hand tools and equipment
- Describe safe use of various shop equipment
- Demonstrate the use of measuring instruments
- Perform basic calculations

### **Bench Work and Layout**

An introduction to bench work and layout. Application of the use and theory of tools such as hand tools, height gages, pedestal grinders, and layout tools.

- Identify layout and hand tools
- Describe the proper use of layout and hand tools
- List the safety procedures in operating a pedestal grinder

- Demonstrate proper use of layout tools using precision and semi-precision procedures
- Adjust clearances on the tool rest and the spark arrestor on the pedestal grinder
- Perform grinding procedures on twist drills and tool blanks
- Perform grinding wheel replacement

### **Blueprint Reading and Sketching**

An introduction to reading and interpreting working drawings for fabrication processes and associated trades. Use of sketching techniques to create pictorial and multiple-view drawings.

- Interpret working drawings including dimensions, notes, symbols, sections, and auxiliary views
- Sketch pictorials and multi-view drawings
- Line conventions and lettering

### **Blueprint Reading for Specific Occupations**

Symbols/graphic language required in the interpretation of working drawings for specific occupations.

- Interpret sketches and working drawings for a specific occupational area
- Correlate elevations, sections, details, plan views, schedules, and general notes
- Scale prints with architectural and engineering scales

### **Drafting for Specific Occupations**

Discussion of theory and practice with drafting methods and the terminology required to prepare working drawings in specific or various occupational fields.

- Define the elements of drafting that pertain to specific or various occupational fields
- Produce working drawings and sketches relevant to an individual technical discipline

### **Grinders, Outside, Internal, Surface**

An introduction to types and operation of outside diameter, internal diameter, and surface grinders. Emphasis on identification, selection, and replacement of grinding wheels. ring tools.

- Proper wheel identification, select proper mounting procedures for different grinder types
- Demonstrate proper balancing techniques
- Demonstrate safe setup and operations

### **Intermediate Layout and Fabrication**

An intermediate course in layout and fabrication. Includes design and production of shop layout and fabrication. Emphasis placed on symbols, blueprints, and written specifications.

- Interpret orthographic and isometric drawings
- Identify fittings, weldments and tools
- Perform layout methods on structural steel and pipe using layout tools and templates

### **Introduction to Layout and Fabrication**

A fundamental course in layout and fabrication related to the welding industry. Major emphasis on structural shapes and use in construction.

- Interpret welding symbols
- Utilize measuring instruments and tools for fabricating projects
- Define layout and fabrication terminology
- Identify structural shapes and materials

### **Machine Shop Mathematics**

Designed to prepare the student with technical, applied mathematics necessary in future machine shop-related courses.

- Define the use of formulas
- Identify conversion methods of numbering systems
- Convert fractions to decimals and back

### **Manufacturing Materials and Processes**

A basic study of various materials used in the manufacturing industry and the chemical, physical, and mechanical properties of various materials. Emphasis on manufacturing processes, including casting, forming and machining.

- Identify ferrous and nonferrous metals
- Describe different manufacturing processes
- Identify by code and color the different types of metals
- Test to determine the kind of metal being used
- Determine whether it is casting or forging

### **Operation of CNC Turning Centers**

CNC operations with an emphasis on turning centers.

- Set up and operate CNC turning centers
- Set the tool and work piece offsets for machining operations
- Edit the program as required

### **Plastic Injection Machines Operations and Systems**

Introduction to the basic operation of typical plastic injection molding machines. Topics include controlling, adjusting, and calibrating the machine for plastic production work; troubleshooting the electrical and hydraulic systems of the injection molding machines; and a survey of advanced machine types and features.

- Describe the way the injection unit works
- Demonstrate the use of troubleshooting analysis, such as fault free analysis
- Explain the overall functions of the injection molding machine
- Demonstrate the adjustment or fine tuning of molding parameters

### **Precision Tools and Measurement**

An introduction to the modern science of dimensional metrology. Emphasis on the identification, selection, and application of various types of precision instruments associated with the machining trade. Practice of basic layout and piece part measurements while using standard measuring tools.

- Perform common methods of measurement conversion

- Determine the degree of precision measurement required
- Identify various types of precision instruments and their applications
- List maintenance procedures on various types of measuring instruments
- Interpret and confirm blueprint requirements
- Convert between English and metric units
- Compute total tolerances of parts
- Calibrate various types of precision measuring instruments to a standard
- Select and use precision measurement tools

### **Specialized Tools and Fixtures**

An advanced course in the designing and building of special tools, such as jigs, fixtures, punch press dies, and molds. Machining and assembling of a production tool using conventional machine shop equipment.

Application of production tool theory, care, and maintenance.

- Demonstrate advanced machine setup and operation
- Explain production tool theory, care, and maintenance
- Define logical sequence of machining operations
- Explain self-managing resources (time, materials, and cost)
- Demonstrate machining to required tolerances
- Interpret engineering drawing and specifications
- Perform close tolerance assembly
- Calculate part clearance/interference
- Align and inspect related project

## **Manufacturing: Automation**

### **Automated Manufacturing**

Introduction to electrical and electronic principles utilized in automated manufacturing processes.

- Describe microcontroller applications in manufacturing
- Identify electrical/electronic components, circuits, and schematics/diagrams used in manufacturing
- Describe operations and applications of sensors and actuators used in manufacturing
- Apply interfacing techniques used in manufacturing
- Apply programming techniques used with microcontrollers

### **Computer Aided Design/Computer Aided Manufacturing**

Computer-assisted applications in integrating engineering graphics and manufacturing. Emphasis on the conversion of a working drawings using computer aided design/computer aided manufacturing (CAD/CAM) software and related input and output devices translating into machine codes.

- Describe the history and application of CAD/CAM systems
- Describe the CAD/CAM components
- Apply CAD/CAM software and related input and output devices

- Interface CAD/CAM to machines

### **Computer Assisted Drafting and Design I**

A course in creating, storing, and retrieving predefined components and adding text and dimensions to drawings.

- Drawing setup
- Create and manage symbols and attributes
- Create dimensioned drawings

### **Computer Numerical Controls**

A study of numerical controlled machine operations in a CAM/CIM environment. Emphasis on standard and computer numerical controlled (CNC) procedures for planning, preparing, and operating a computer-assisted machine.

- Summarize the history of numerical control
- Determine the proper tooling, programming, and set up of specific numerical control operations
- Employ programming for the appropriate machine operations
- Integrate the computer-controlled system with other procedures

### **Computerized Numerical Control Programming**

An introduction to G and M codes (RS274-D) necessary to program Computer Numerical Controlled (CNC) machines.

- Write, simulate, edit execute CNC programs
- Calculate the feeds and speeds for various materials
- Select the appropriate tooling

### **Fundamentals of Computer Numerical Controlled (CNC) Machine Controls**

Programming and operation of Computer Numerical Controlled (CNC) machine shop equipment.

- Demonstrate operations of CNC machine controls
- Compare and contrast the differences between conventional and CNC machines
- Utilize CNC machine applications for machining operations

### **Introduction to Automated Manufacturing**

Overview of automated manufacturing principles; including manufacturing process, control systems, and measurement theory.

- Identify fundamental concepts of manufacturing
- Identify safety, health, environmental, and ergonomic issues in manufacturing
- Identify quality and continuous improvement methods
- Describe the importance of maintenance within manufacturing
- Define processes and production steps in manufacturing



## **Introduction to Computer Assisted Drafting and Design**

Topics include CAD equipment selection and interface; software selection and installation; creating, editing and plotting of line drawings for architectural, electrical, circuit, mechanical, or interior design; create/modify graphic elements, storing and retrieving predefined components; and adding text and dimensions.

- Identify and use of operating software
- Identify and use CAD software
- Identify and use computer hardware to produce CAD drawings

## **Introduction to Computer-Aided Manufacturing (CAM)**

A study of Computer-Aided Manufacturing (CAM) software which is used to develop applications for manufacturing. Emphasis on tool geometry, tool selection, and the tool library.

- Use Computer-Aided Manufacturing software to create part programs
- Transfer programs to the machine control unit
- Machine parts

## **Specialized Basic Computer Aided Drafting (CAD)**

A supplemental course to Basic Computer Aided Drafting using an alternative computer-aided drafting (CAD) software to create detail and working drawings.

- Create, organize, display, and plot working drawings using an alternative CAD software
- Use file management techniques
- Use external referencing of multiple drawings to construct a composite drawing

## **Specialized Computer-Aided Drafting (CAD)**

A supplemental course to Basic Computer-Aided Drafting using an alternative computer-aided drafting (CAD) software.

- Discuss alternative CAD software
- Create, organize, display, and plot working drawings using an alternative CAD software
- Use file management techniques

# **Manufacturing: Maintenance**

## **Building Maintenance I**

Basic principles of residential and commercial maintenance and repair. Emphasis on safety, materials, and tools.

- Identify and demonstrate use of measuring devices
- Explain safety procedures for building maintenance
- Identify and use hand and power tools
- Summarize building maintenance functions
- List materials used in building maintenance

## **Building Maintenance II**

Continuation of Building Maintenance I with emphasis on the operational aspects of maintaining and repairing facilities.

- Use hand and power tools associated with building maintenance
- Select and use materials associated with building maintenance
- Use precise measuring devices for facility operation
- Summarize system operations associated with facility operations

## **Building Maintenance Skills**

Basic electrical, plumbing, and carpentry skills required to identify and correct minor problems in building maintenance.

- Demonstrate electrical, plumbing, and carpentry skills required to identify and correct minor problems in building maintenance
- Identify and demonstrate use of measuring devices
- Explain safety procedures for building maintenance
- Identify proper use of hand and power tools used in building maintenance
- Summarize building maintenance functions
- List materials utilized in building maintenance

# **Manufacturing: Quality Lean Manufacturing**

## **5S Workplace Organization**

With the 5S's: Workplace Organization online training course, employees will learn the fundamental concepts of the 5S's that will improve quality and productivity. The training includes step-by-step guidelines for achieving the 5S's as well as a roadmap to implement the 5S's throughout the entire organization. Many examples of 5S success stories are included throughout the training.

- Understand each of the five S's and how each "S" builds upon the previous "S"
- Apply the 5S's to their work area
- Develop (or participate in the development of) a 5S Implementation Roadmap

## **7 Basic Tools of Quality**

Organized problem-solving efforts utilize a variety of quality tools for problem analysis. The 7 QC Tools are scientific management tools, which are basic and easy to understand. They form the fundamental & critical foundation for all problem solving and quality control activities.

- Use and recognize the power in each of the 7 QC Tools
- Construct the tools (manually and fast paced by using computer spreadsheet software)
- Solve problems effectively using a step-by-step process
- Interpret and make accurate business decisions using the correct tools
- Experience the Quality Control Circle (QCC) way of presenting an improvement business project to a targeted audience
- Experience the team dynamics in solving problems

- Use the MS Excel working templates to solve problem back in their workplace

## **8D Methodology**

8D Problem-Solving Training teaches participants how to solve problems in a team setting using the 8D (8Discipline) problem-solving method. Each of the eight steps is presented and explained in detail.

- Understand and use the 8D Problem-Solving process to solve problems
- Work on and contribute to a problem-solving team
- Apply the appropriate problem-solving tools throughout the 8D problem-solving process

## **Certified Logistics Technician Program**

The purpose of the Certified Logistics Technician (CLT) program is to recognize through certification individuals who demonstrate mastery of the core competencies of material handling at the front-line (entry-level through front-line supervisor) through successful completion of the certification assessments. The goal of the CLT certification program is to raise the level of performance of logistics workers both to assist the individuals in finding higher-wage jobs and to help employers ensure their workforce increases the company's productivity and competitiveness.

The CLT program consists of two parts before sitting for the CLT assessment, candidates must have a CLA Certificate:

- Foundational-level Certified Logistics Associate (CLA) Certificate
- Mid-level technical CLT Certification

## **Certified Production Technician Program**

The purpose of the Certified Production Technician (CPT) program is to recognize through certification individuals who demonstrate mastery of the core competencies of manufacturing production at the front-line (entry-level through front-line supervisor) through successful completion of the certification assessments. The goal of the CPT certification program is to raise the level of performance of production workers both to assist the individuals in finding higher-wage jobs and to help employers ensure their workforce increases the company's productivity and competitiveness.

The CPT program consists of four individual certificate modules. Candidates must earn the first four certificates to receive the full CPT certification:

- Safety
- Quality Practices & Measurement
- Manufacturing Processes & Production
- Maintenance Awareness and Green Production.

## **Concepts of Total Quality Management**

Principles and elements of total quality management.

- Explain the concepts of total quality management
- Explain tools of total quality management
- Demonstrate how to maintain total quality management

## **Food Safety**

This course is a study of personal cleanliness; sanitary practices in food preparation; causes, investigation, and control of illness caused by food contamination (Hazard Analysis Critical Control Points); and work place safety standards.

- Identify causes of and prevention procedures for food-borne illness, intoxication, and infection.
- Demonstrate good personal hygiene and safe food handling procedures; describe food storage and refrigeration techniques; explain sanitation of dishes, equipment, and kitchens including cleaning material, garbage, and refuse
- Discuss Occupational Safety and Health Administration (OSHA) requirements and effective workplace safety programs.

## **Internal Audit ISO 9001:2015**

This course was developed considering the ISO 19011 standard and is designed to introduce the student to the ISO 9001:2015 quality management system standard and prepare them to conduct effective internal audits.

- Overview of the ISO 9001:2015 Quality Management Standard
- ISO 9001 internal auditing requirements
- Auditing - terms and definitions
- Audit objectives, trademarks, and philosophy
- Audit types
- Planning scheduling, personnel requirements and records
- Responsibilities of audit team members and auditee
- Primary audit phases of planning, conduct, and closure
- Audit methods, ethics, time utilization and effectiveness
- Questioning techniques
- Process auditing methods with introduction to tools such as Turtle, Spider and SIPOC diagrams; checklists; flow diagrams; and Process Activity Diagrams
- Classification of audit findings
- Report generation
- Audit follow-up and closure

## **Introduction to Quality Assurance**

Introduction to information on quality assurance principles and applications. Overview of the quality assurance profession.

- Describe the applications of quality assurance
- Utilize tools
- Apply sampling techniques for quality assurance

## **ISO 14001:2015**

Provide participants with an understanding of the requirements of the standard and help you identify gaps in your current EMS.

- Explain the requirements, structure, purpose and background of ISO 14001:2015
- Identify typical gaps for companies transitioning from the 2004 to the 2015 standard
- Apply the concepts of risk-based thinking
- Contribute to the development of your organization's ISO 14001:2015 implementation
- Defining and articulating basic EMS terminology
- Explain how to build an EMS

## **Metrology**

Terminology, methodology, and practice of measurement systems and equipment in the calibration and use of basic measuring tools.

- Apply accepted methods and procedures to perform metrology
- Verify traceability to established standards and/or regulations
- Complete calibration certificates
- List the strengths and disadvantages of each measurement system

## **Principles of Lean Manufacturing**

Study of principles of lean manufacturing; including a systematic approach to reducing costs and lead-time.

- Identify basic elements of the lean manufacturing process
- Explain efficient production systems
- Identify all the steps in the value stream

## **Principles of Quality Management**

Includes planning and implementing quality programs in an organization and analyzing cost/benefit of quality. Also covers the impact of employee empowerment.

- Define the role of quality in production and service systems
- Explain concepts related to quality cost/benefit
- Define the quality improvement process

## **Quality Assurance**

Principles and applications designed to introduce quality assurance.

- Describe the benefits and applications of quality assurance
- Demonstrate proficiency in the use of the tools of quality assurance
- Apply sampling techniques
- Evaluate quality assurance standards
- Perform system audits
- Implement a corrective and preventative action plan

## **Quality Control**

Quality control principles and applications.

- Describe the benefits and applications of quality control
- Apply quality control tools and techniques

- Demonstrate planning and organization of quality control systems
- Analyze the cost of poor quality in industry

### **Statistical Process Control**

Components of statistics including techniques of collection, presentation, analysis, and interpretation of numerical data as applied to statistical control. Stresses application of correlation methods, analysis of variance, dispersion, sampling, quality control, reliability, mathematical models, and programming.

- Describe the benefits and applications of statistical process control
- Demonstrate proficiency in the use of the seven tools of statistical process control
- Analyze data to calculate control limits
- Identify out of control conditions

### **Total Quality Management**

The study of integrating work processes using team participation through employee empowerment and teamwork emphasizing the philosophy of customer service and satisfaction.

- Summarize the history and philosophy of management systems
- Identify the tools of total quality management
- Explain customer and supplier relationships
- Demonstrate team building skills
- Identify processes involved with continuous improvement

### **Transition to ISO 9001:2015**

The purpose of this training course is to help organizations understand how the revised standard will impact their existing QMS, and to plan for transition to the new standard, in view of the changes in the revised ISO 9001:2015 compared to 2008 version.

- Background and evolution of Quality Management System
- Understanding of the new structure - Annex SL or HLS
- Exploring new terminologies and definitions
- Interpret the context of the organization & its significance to QMS
- Introduction to risk-based approach used in the revised standard
- Understanding the impact of new Leadership clause
- Integration of QMS into the organization's business processes
- Other changes to the ISO 9001 standard
- Transition process, strategy and timeline, from ISO 9001:2008 to ISO 9001:2015

### **Value Stream Mapping (VSM)**

A value stream is another term for a process that has inputs, performs work on those inputs, and generates an output that has added value. The basic premise of a value stream is that value is added as goods or services stream through the process. Unfortunately, some actions, task, and activities continued within most all value streams do not add value; those non-value-adding task or activities represent waste in the process or value stream.

- Describe the purpose of a Value Stream Map

- Identify the key components of a Value Stream Map
- Explain the key steps in developing the Future State Map
- Work as a productive member of a team tasked with conducting a value stream analysis

## **Manufacturing: Supply Chain**

### **Basics of Inventory Management**

Management of inventory related to its impact on customer service, profitability and return on investment.

- Describe the concepts and best practices in inventory management
- Articulate how manufacturing strategies define and impact inventory strategies
- Describe the financial costs associated with inventory
- Relate how changes can be made to reduce inventory while improving customer service

### **Fundamentals of Manufacturing Control**

A detailed study of priority and capacity management through the use of material requirements planning (MRP), capacity management, capacity requirements planning (CRP), production activity control (PAC), and Just-In-Time (JIT). Exploration of the execution of the production place and master production schedule, reactions to capacity constraints, and maintenance of individual order control.

- Describe the various methods of manufacturing management such as MRP, CRP, PAC, JIT
- Utilize the methods of manufacturing management in the production environment
- Mitigate production problems using risk management and root cause analysis tools

### **Introduction to Business Logistics**

A systems approach to managing activities associated with traffic, transportation, inventory management, warehousing, packaging, order processing, and materials handling.

- Explain the terms and how they relate to the overall concept of logistics
- Explain the legal aspects and regulatory agencies as they relate to logistics management
- Demonstrate ability to apply decision making techniques based on time, materials, and space

### **Materials Requirement Planning**

A study of materials requirement planning that includes net change versus regenerative systems, lot sizing, and the time sharing of dependent demand.

- Employ the concept of net change
- Execute regenerative systems
- Construct lot sizing and time sharing of dependent demand items

### **Principles of Purchasing**

The purchasing process as it relates to such topics as inventory control, price determination, vendor selection, supply chain management, negotiation techniques, and ethical issues in purchasing.

- Describe the purchasing function as it relates to departments within the company
- Identify the basic concepts used in purchasing decisions including negotiation techniques and

ethical issues

- Explain the relationships of materials management and inventory control with the purchasing process
- Explain supply chain management

### **Warehouse and Distribution Center Management**

Emphasis on physical distribution and total supply chain management. Includes warehouse operations management, hardware and software operations, bar codes, organizational effectiveness, just-in-time, and continuous replenishment.

- Discuss total supply chain management and its function in the physical distribution system
- Identify and demonstrate current technology utilized in warehouse management operations
- Apply the technology utilized in organizational effectiveness including time and money management and acquisition procession
- Interpret information with relationship to inventory management

# Safety

## Safety Courses

### **Accident Prevention, Inspection, and Investigation**

Provides a basis for understanding the nature of occupational hazard recognition, accident prevention, loss reduction, inspection techniques, and accident investigation analysis.

- Describe the components of an effective accident investigation
- Analyze factors which contributed to accidents
- Recommend appropriate changes to prevent further accidents
- Explain the components of an effective safety inspection and make appropriate recommendations to correct hazards identified by the inspection

### **Basic Safety and Health**

Basic concepts of safety and health.

- Identify common hazards and corrective actions in the workplace
- Incorporate job safety analysis (JSA)
- Incorporate appropriate training

### **Basic Safety Communications**

Establish basic safety skills for workplace.

- Follow safety instructions and procedures
- Recognize signs and labels
- Report unsafe working conditions and accidents



## **Construction Site Safety and Health**

Introduction to safety requirements for construction sites including occupational health and environmental controls.

- Identify hazards on a construction site
- apply regulations to the construction job site
- write a job site safety analysis (JSA)

## **CPR**

Lifesaving skills of respiratory and cardiac emergencies involving adults, children, and infants. This course was designed to be repeated multiple times to improve student proficiency.

- Demonstrate proficiency in Cardiopulmonary Resuscitation (CPR) at a healthcare provider level according to current guidelines of the credentialing agency
- Demonstrate choking lifesaving skills as recommended by the American Heart Association
- Describe the key steps in first aid

## **Energy Industrial Safety**

An overview for industrial workers of state/federal regulations and guidelines which require industrial safety training. Topics include the 29 C.F.R. 1910, 1926 and National Fire Protection Association (NFPA) 70E standards such as confined space entry, emergency action, lock out/tag out, arc flash, and other work related subjects.

- Describe the basic components of safety, health, and environmental systems as defined by the Occupational Safety and Health Administration
- describe Hazardous Waste Operator (HAZWOPER) standards
- locate Safety Data Sheets (SDS) and interpret the data
- select and don Personal Protective Equipment (PPE)
- perform lock out/tag out procedures
- complete a confined space and hot work permit
- select and employ fall protection equipment
- fill out a Job Hazard Analysis (JHA)

## **Ergonomics and Human Factors in Safety**

The relationship of human behavior and ergonomics as applied to workplace safety.

- Explain the psychology of human behavior as it relates to workplace safety
- identify ergonomic hazards; recommend appropriate controls
- relate the human and workplace factors which contribute to ergonomic hazards

## **Fabrication Safety Training**

Safety compliance focusing on fabrication in various manufacturing/industry settings.

- Demonstrate safe operation of equipment, hand, and power tools used in fabrication and manufacturing industries

## **Fire Protection Systems**

Study of fire protection systems and their applications with emphasis on the fire prevention codes and standards.

- Explain the elements of fire chemistry theory
- summarize fire protection methods
- describe appropriate application of each fire protection method
- identify the applicable codes and standards in the industrial/business environment

## **Fire Protection Training - Portable Fire Extinguishers**

An introduction to the selection and uses of portable fire extinguishers.

- Identify fire classifications
- Select correct extinguisher
- Demonstrate application procedures to an accepted standard

## **First Aid**

Instruction in first aid for injured and ill persons.

- Discuss and demonstrate management of injured and/or ill persons as recommended by the certifying agency
- Discuss first aid basics, medical emergencies, injury emergencies as recommended by the American Heart Association
- Discuss environmental emergencies as recommended by the American Heart Association

## **Introduction to Safety and Health**

An introduction to the basic concepts of safety and health.

- Identify appropriate procedures to minimize or prevent injuries and illness in the workplace
- Incorporate job safety analysis (JSA) and appropriate training
- Name elements of an effective safety culture

## **Material Handling**

Proper methods for material handling and storage including safety practices, proper equipment usage, engineering controls, and personal protective equipment.

- Explain precautions and controls to eliminate injuries due to manual material handling and storage
- Explain proper material handling engineering principles regarding hoisting and conveying equipment
- Describe the safe work practices utilizing ropes, chains, and slings
- Identify toxic hazards of handled materials and establish the necessary precautions
- Identify industry regulations necessary for formal training materials

## **Mechanical Lift Training**

Provide participants with orientation and hands on training for safe operation of mechanical lifts.

- Explain the procedures used to safely perform tasks related to mechanical lifts

### **Occupational Safety and Health Management**

Explores the major safety issues that affect the work place, including general safety awareness, loss control and regulatory compliance.

- Identify legal record keeping and components of the safety program for various industries as required
- Identify and apply the basic concepts of emergency preparedness
- Identify and describe the concepts and measurements of proactive versus reactive safety

### **OSHA Regulations - Construction Industry**

A study of Occupational Safety and Health Administration (OSHA) regulations pertinent to the construction industry.

- Identify the OSHA regulations which apply to the construction industry
- demonstrate proficiency in retrieving specific information from Title 29 C.F.R. Part 1926 regulations

### **OSHA Regulations - General Industry**

A study of Occupational Safety and Health Administration (OSHA) regulations pertinent to general industry.

- Identify the OSHA regulations which apply to general industry
- Demonstrate proficiency in retrieving specific information from Title 29 C.F.R. Part 1910 regulations
- Discuss safety and health programs

### **Physical Hazards Control**

A study of the physical hazards in industry and the methods of workplace design and redesign to control these hazards. Emphasis on the regulation codes and standards associated with the control of physical hazards.

- Identify the common physical hazards in industry
- design a hazard free work environment
- utilize hazard recognition techniques to implement safe control practices
- describe the hazard control measures used in workplace designs
- list Occupational Safety and Health Administration (OSHA) standards and other applicable codes and describe their applications

### **Powered Industrial Truck Operator Training**

A course designed to reduce powered industrial truck accidents by creating safety awareness in lift truck operators. The focus is on efficient and safe lift truck operations and the OSHA training requirements for powered industrial trucks.

- Identify truck controls and their functions
- Demonstrate safety awareness by avoiding workplace hazards
- Drive safely in a variety of industrial environments

- Demonstrate proper inspection and operation of powered industrial trucks

### **Principles of Safety Engineering**

Methods to predict, eliminate, or reduce unsafe conditions at the design and construction stage utilizing engineering controls. Includes methods of analysis, prioritization, and implementation of control measures for potentially hazardous situations in the workplace.

- Describe the safety engineering issues of a typical industrial workplace
- evaluate blueprints to predict unsafe conditions for construction and other industrial sites
- analyze the safety requirements for workers with disabilities
- select applicable safety engineering requirements for equipment, automated lines, systems and/or processes as protective devices
- employ safety engineering principles in designing a manufacturing facility
- develop engineering controls for unsafe conditions in a typical fabrication layout

### **Safety and Accident Prevention**

Recognize and evaluate hazards in the workplace and implement control measures including engineering, administrative, and personal protective equipment.

- Recognize common occupational hazards
- Describe the components of effective workplace design and accident prevention programs
- Demonstrate correct selection and safe use of personal protective equipment

### **Safety Communications**

Improve safety and communication skills for the workplace.

- Follow safety instructions and procedures
- Document unsafe working conditions
- Report accidents
- Identify applicable regulatory standards

### **Safety Program Management**

Examine the major safety management issues that affect the workplace including safety awareness, loss control, regulatory issues, and human behavior modification.

- Develop and implement safety program
- describe cost benefit analysis
- summarize the basic components of human behavior modification
- apply the components of the safety audit process including record keeping requirements

### **Safety Training Presentation Techniques**

Principles of developing and presenting effective industrial/business training. Emphasis on instructor qualifications and responsibilities, principles of teaching including use of teaching aids and presentation skills.

- Develop lesson plans, teaching activities, and presentations
- describe instructor qualifications and responsibilities

- apply principles of learning and techniques of instruction to develop effective industrial/business training

### **Workplace Safety**

Introduction to specific training techniques involving the safe handling of blood and air borne pathogens as well as general safety and security on the premises. Addresses the right to know and SDS. Outlines Occupational Safety and Health Administration (OSHA) regulations, inspections, penalties, and compliance.

- Demonstrate proficiency in handling situations where blood and air borne pathogens are present
- Explain the importance of performing tasks safely and correctly
- Explain SDS

# **Welding**

## **Welding Courses**

### **Advanced Arc Welding**

This course covers advanced principles of welding with emphasis on special processes and special needs of students.

- Describe effects of preheating and postweld heating
- Explain precautions used when welding various metals and alloys
- Perform open groove welds with mild steel and low alloy electrodes in all positions

### **Advanced Flux Cored Arc Welding**

Advanced concepts of flux cored arc welding of structural and fabricated steel products. Skill development in multi-pass fillet and v-groove welding.

- Perform safety inspections of equipment and accessories
- Perform multi-pass fillet and v-groove welds in various positions
- Describe the effects of welding parameters

### **Advanced Gas Metal Arc Welding (GMAW)**

Advanced topics in Gas Metal Arc Welding (GMAW). Includes welding in various positions.

- Demonstrate proficiency in various welding positions
- Describe safety practices and equipment use
- Describe the effects of welding parameters in GMAW
- Weld various joint designs and perform appropriate inspection

### **Advanced Gas Tungsten Arc Welding (GTAW)**

Advanced topics in GTAW welding, including welding in various positions and directions.

- Demonstrate proficiency in various welding positions

- Describe safety rules and equipment used
- Describe the effects of welding parameters in GTAW
- Weld various joint designs
- Diagnose welding problems
- Perform visual inspection

### **Advanced Layout and Fabrication**

An advanced course in layout and fabrication. Includes production and fabrication of layout, tools, and processes. Emphasis on application of fabrication and layout skills.

- Apply appropriate techniques of fabrication
- Design welding projects
- Prepare drawings
- Produce templates
- Apply layout offsets
- Calculate take offs
- Formulate bills of materials
- Apply mathematical concepts in the construction of projects

### **Advanced Oxy-Fuel Welding and Cutting**

A study of all position welding on ferrous and nonferrous metals using oxy-fuel welding process, including welding and cutting, brazing, and soldering operations.

- Demonstrate oxy-fuel welding procedures
- Demonstrate advanced oxy-fuel welding and cutting operations
- Select appropriate tools, equipment, and materials

### **Advanced Pipe Welding**

Advanced topics involving welding of pipe using the shielded metal arc welding (SMAW) process. Topics include electrode selection, equipment setup, and safe shop practices. Emphasis on weld positions 5G and 6G using various electrodes.

- Describe equipment
- Describe required pipe preparation
- Perform 5G and 6G welds using various electrodes

### **Advanced Shielded Metal Arc Welding (SMAW)**

Advanced topics based on accepted welding codes. Training provided with various electrodes in shielded metal arc welding processes with open V-groove joints in various positions.

- Describe effects of preheating and postweld heating
- Explain precautions used when welding various metals and alloys
- Distinguish between qualification and certification procedures
- Troubleshoot welding discontinuities
- Perform open groove welds with low carbon steel and low alloy electrodes in various positions.

## **Fundamentals of Gas Metal Arc Welding (GMAW)**

Fundamentals of Gas Metal Arc Welding (GMAW). Includes setup and safe use of GMAW equipment as well as instruction in various basic weld joints

- Describe welding positions of basic weld joints
- Describe safety rules, equipment use and basic visual inspection
- Demonstrate proper welding of basic joints in the flat position

## **Fundamentals of Gas Tungsten Arc Welding (GTAW)**

Fundamentals of Gas Tungsten Arc Welding (GTAW). Includes setup and safe use of GTAW equipment as well as instruction in flat positions on joint designs.

- Describe various joint designs
- Describe safety rules and equipment
- Perform basic visual inspection of equipment
- Demonstrate proper welding techniques of ferrous or non-ferrous metal in the flat position

## **Fundamentals of Oxy-Fuel Welding and Cutting**

Oxy-fuel welding and cutting equipment. Includes equipment safety, setup, and maintenance.

- Demonstrate proper set up and use of oxy-fuel welding equipment
- Demonstrate safety procedures for oxy-fuel equipment
- Demonstrate proper welding of basic joints and basic cutting

## **Intermediate Arc Welding**

This course covers manipulative skills in welding techniques, applications, and theory.

- Describe arc welding operations
- Prepare test plates
- Perform fillet welds
- Perform air carbon arc weld removal
- Perform bevel groove welds with backing plates

## **Intermediate Pipe Welding**

A comprehensive course on the welding of pipe using the shielded metal arc welding (SMAW) and/or other processes. Welds will be done using various positions. Topics covered include electrode selection, equipment setup, and safe shop practices.

- Describe equipment and required pipe preparation
- Perform welds using various positions
- Electrode selection, equipment setup and safe shop practices

## **Intermediate Shielded Metal Arc Welding (SMAW)**

A study of the production of various fillets and groove welds. Preparation of specimens for testing in various positions.

- Identify principles of arc welding

- Describe arc welding operations of fillet and groove joints
- Explain heat treatments of low alloy steels
- Explain weld size and profiles
- Prepare test plates
- Perform fillet welds in the overhead position
- Perform air carbon arc weld removal
- Perform bevel groove welds with backing plates in various positions
- Demonstrate use of tools and equipment

### **Intermediate Welding Using Multiple Processes**

Instruction using layout tools and blueprint reading with demonstration and guided practices with some of the following welding processes: oxy-fuel gas cutting and welding, shield metal arc welding (SMAW), gas metal arc welding (GMAW), flux-cored arc welding (FCAW), gas tungsten arc welding (GTAW).

- Identify proper safety equipment and tools
- Select the proper welding process for a given application
- Demonstrate skills using more than one approved welding process
- Analyze situations and make decisions concerning safety and electrode selections

### **Introduction to Flux Cored Arc Welding (FCAW)**

An overview of terminology, safety procedures, and equipment set-up. Practice in performing various joints using Flux Cored Arc Welding(FCAW) equipment.

- Demonstrate equipment safety checks
- Identify Flux Cored Arc Welding (FCAW) equipment parts
- Demonstrate the procedures for welding various joints in various positions

### **Introduction to Gas Metal Arc Welding (GMAW)**

Principles of gas metal arc welding, setup and use of Gas Metal Arc Welding (GMAW) equipment, and safe use of tools/equipment. Instruction in various joint designs.

- Describe welding positions with various joint designs
- Describe the effects of welding parameters in GMAW
- Apply safety rules
- Troubleshoot equipment used, perform visual inspection
- Weld various types of structural material
- Diagnose welding problems

### **Introduction to Gas Tungsten Arc (GTAW) Welding**

Principles of gas tungsten arc welding (GTAW), including setup, GTAW equipment. Instruction in various positions and joint designs.

- Describe various joint designs
- Describe safety rules and equipment
- Describe the effects of welding parameters in GTAW
- Weld various structural materials



## **Introduction to Oxy-Fuel Welding and Cutting**

An introduction to oxy-fuel welding and cutting, safety, setup and maintenance of oxy-fuel welding, and cutting equipment and supplies.

- Demonstrate oxy-fuel welding and cutting safety procedures
- Classify fuels and filler metals
- Perform entry-level oxy-fuel welding and cutting operations and select proper equipment and materials

## **Introduction to Pipe Welding**

An introduction to welding of pipe using the shielded metal arc welding process (SMAW), including electrode selection, equipment setup, and safe shop practices. Emphasis on various welding positions and electrodes.

- Describe equipment and required pipe preparation
- Equipment setup
- Perform welds using various positions and electrodes

## **Introduction to Shielded Metal Arc Welding (SMAW)**

An introduction to the shielded metal arc welding process. Emphasis placed on power sources, electrode selection, and various joint designs.

- Select electrodes and amperage settings for various thicknesses of materials and welding positions
- Define principles of arc welding
- Explain electrode classifications
- Perform SMAW operations utilizing various positions electrodes and joint designs

## **Introduction to Welding**

Equipment used in oxy-fuel and arc welding. Includes cutting of ferrous metals. Emphasizes welding and cutting safety and basic welding processes.

- Identify safety procedures associated with oxy-fuel and arc welding
- Identify safety procedures associated with cutting processes
- Demonstrate basic welding and cutting

## **Introduction to Welding Metallurgy**

A study of metals from the ore to the finished product. Emphasis on metal alloys, heat treating, hard surfacing, welding techniques, forging, foundry processes, and mechanical properties of metal including hardness, machinability, and ductility.

- Describe technical terms used in metallurgy and classification of metals
- Identify metals and how they are processed and used in industry
- Describe mechanical and physical properties, surface treatments, and heat treatment of metals

## **Introduction to Welding Using Multiple Processes**

Basic welding techniques using some of the following processes: Oxy-fuel welding (OFW) and cutting, shielded metal arc welding (SMAW), gas metal arc welding (GMAW), flux cored arc welding (FCAW), and gas tungsten arc welding (GTAW).

- Demonstrate machine set-up and complete welds and cutting operations
- Demonstrate basic shop safety
- Identify types of consumables used in welding processes
- Identify various welding and cutting practices
- Demonstrate proper joint preparation techniques

## **Pipe Welding**

This course covers pipe welding techniques and applications.

- Demonstrate safe shop practices
- Describe equipment and pipe preparation
- Perform 1G, 2G, 5G, and 6G welds with various electrodes

## **Shielded Metal Arc Welding**

This course covers the theory and introduction to the shielded metal arc welding (SMAW) processes. Skill in the welding process and the selection of materials and equipment will be stressed.

- Define the principles of arc welding
- Interpret electrode classifications
- Perform welding operations in various positions using different joint designs

## **Welding Fundamentals**

An introduction to the fundamentals of equipment used in oxy-fuel and arc welding, including welding and cutting safety, basic oxy-fuel welding and cutting, basic arc welding processes and basic metallurgy.

- Demonstrate safety procedures associated with oxy-fuel and arc process
- Perform basic welds using oxy-fuel and arc welding equipment
- Identify various metals