
Construction Technology

Addition and Subtraction

Objectives:

- List the physical hazards associated with chemicals and describe how to avoid them
- Name several electrical shock hazards and the techniques used to prevent shocks
- List the steps in a lockout/tagout procedure
- Explain the importance of machine guarding, and name several types of machine guards
- Name the five classes of fire and how to extinguish each of them
- Describe the proper technique used to manually lift a heavy load
- Explain how to avoid hand injuries when using hand and power tools
- List some of the hazards involved in welding and hot cutting operations and how to prevent them
- Explain how job analysis and ergonomics are used to improve the workplace
- Explain the importance of using personal protective equipment (PPE)
- Name the agencies and organizations that make and enforce safety

Multiplication and Division

Objectives:

- Recognize the different ways in which a chemical can cause you physical injury
- Name the paths of entry along which chemicals enter your body
- Describe the basic types of injuries caused by chemicals
- Identify potential chemical hazards in the workplace
- Describe how to identify, store, and label hazardous chemicals
- List several methods used to prevent chemical accidents
- Explain why proper training is important to chemical handling
- Describe the types of personal protective equipment used when handling chemicals
- Explain the role of government agencies in enforcing chemical regulations

Fractions, Percents, Proportions, and Angles

Objectives:

- Describe the types of property losses and injuries associated with fires
- Explain how fires are ignited
- Identify the five classes of fire
- Describe the primary fire hazards found in the workplace
- Explain the various ways in which fires can be prevented
- Describe the operation of several different fixed fire protection systems
- Identify the proper type of portable fire extinguisher to use on a fire
- Describe the operation of several different types of fire extinguishers
- Explain how to defend yourself and others in a fire situation
- Describe how to evacuate a burning building in a safe manner

Metric System

Objectives:

- Identify common welding gases and the hazards associated with each of them
- Safely handle and store different types of gas cylinders
- Recognize the safety considerations involved in the setup and operation of electric arc-welding equipment
- Explain how to safely set up and operate a basic gas welding rig
- Identify welding equipment malfunctions and take corrective action
- Utilize fire prevention and protection methods specific to welding operations
- Discuss the importance of the hot-work-permit program in your facility
- Explain the correct use of protective clothing and equipment for welding
- Understand the importance of proper ventilation when welding
- Describe how to effectively deal with confined spaces when performing welding operations

Formulas

Objectives:

- Explain how electricity can harm you and property
- Discuss the importance of using quality electrical components
- Describe why it's important to properly ground electrical installations
- Understand the type of equipment used in hazardous locations
- List the safety practices required when performing electrical work
- Discuss the importance of workspace clearance around electrical enclosures

Introduction to Algebra

Objectives:

- Recognize the hazards associated with handling materials
- Know the types of injuries that can be caused by these hazards
- Understand how to effectively use safe material-handling practices
- Know how to avoid physical injury when handling loads
- Identify the parts of a powered lift truck and similar mechanized material-handling equipment
- Explain how to operate various types of mechanized material-handling equipment safely
- Know and follow the rules for safe operation of powered industrial material-handling equipment
- Understand and respect the limits and restrictions placed on powered material handling mechanisms

Linear Distance and Measurement

Objectives:

- Recognize the basic machine motions that can present a hazard to you
- Recognize the types of machinery most likely to be hazardous to you
- Understand the types of injuries caused by accidents commonly associated with unsafe machine-operating procedures
- Discuss the importance of machine guarding and how to incorporate methods of guarding to avoid physical injury
- Recognize the types of machine guards commonly used in industry
- Control various forms of hazardous machine energy through the use of lockout/tagout procedures
- Understand how and why to properly use personal protective equipment for added protection when operating industrial equipment

Bulk Measurement

Objectives:

- Define the following terms: whole number, numeral, digit, decimal, place value, addend, sum, minuend, subtrahend, and difference
- Properly place commas in large numbers
- Explain the significance of the digit zero in a number
- Differentiate between concrete and abstract numbers
- Properly prepare numbers for addition and subtraction
- Perform addition and subtraction on numbers
- Check your answers to both addition and subtraction problems
- Use a calculator to add and subtract numbers

Temperature Measurement

Objectives:

- Define the following terms: factor, multiplicand, multiplier, partial product, product, dividend, divisor, quotient, and remainder
- Recognize the various signs used for multiplication and division
- Properly prepare numbers for multiplication and division
- Perform multiplication and division on whole numbers, decimal numbers, and mixed decimal numbers
- Check your answers to both multiplication and division problems
- Find the average of a group of numbers
- Use a calculator to multiply and divide numbers

Energy, Force, and Power

Objectives:

- Define the following terms: fraction, proper fraction, improper fraction, lowest common denominator, percent, ratio, and proportion
- Add, subtract, multiply, and divide fractions
- Change fractions to decimals and decimals to fractions
- Solve problems involving percent
- Work with ratios and equivalent ratios
- Solve proportion problems
- Use a protractor to measure angles
- Lay out templates for checking angles
- Use a calculator to solve percent problems, to convert fractions to decimals, and to calculate missing terms in proportions

Fluid Measurement

Objectives:

- Name the base units most commonly used in the metric system and identify what they're used to measure
- Identify metric prefixes and their values
- Apply conversion factors to create a unit that's larger or smaller than the base unit
- Estimate lengths in metric units
- Express temperature in degrees Celsius
- Define the terms mass, density, force, torque, and pressure, and identify the metric units used to measure each one
- Use a conversion table to convert metric units to English units and English units to metric units
- Use a calculator to perform metric conversions

Trades Safety: Getting Started

Objectives:

- Explain the use of variables in formulas
- Prepare and use formulas to solve problems
- Use formulas to calculate the perimeter of a triangle and a rectangle, and the area of a triangle, a rectangle, and a circle
- Use formulas to calculate distance, current in a circuit, and the volume of a pyramid and a sphere
- Use a calculator to find square roots and solve formulas
- Substitute given numerical values for letters in a formula and find the unknown quantity
- Transform and solve equations and formulas

Working Safely with Chemicals

Objectives:

- Explain the difference between positive and negative numbers and their uses
- Perform basic arithmetic operations with signed numbers
- Raise a number to any power
- Use the order of operations for solving problems involving multiple operations
- Define the following words: term, constant, coefficient, exponent, monomial, trinomial, and polynomial
- Identify and combine like terms in an expression
- Perform basic arithmetic operations with signed terms
- Multiply and divide terms containing exponents n
- Remove parentheses from an expression and simplify the expression

Fire Safety

Objectives:

- Identify properties and types of angles and figures
- Distinguish between common geometric solids
- Use the Pythagorean theorem to solve triangles
- Calculate the perimeter and area of polygons, circles, and ellipses
- Determine the surface area and volume of commonly encountered geometric solids

Safe Handling of Pressurized Gases and Welding

Objectives:

- Define and compute the value of trigonometric functions such as cosine, sine, tangent, and others
- Use trigonometric functions to find the lengths of sides and angles in right and oblique triangles
- Understand trigonometric functions as they relate to waves
- Solve practical problems using trigonometry

Advanced Electrical Safety

Objectives:

- Identify the various kinds of lines used on drawings
- Compare and contrast the various types of drawings
- Relate the information given in the title block and bill of material to the drawing
- Define different types of scales used on drawings
- Identify the different views used on drawings

Material-Handling Safety

Objectives:

- Properly interpret working drawings (including dimensions and tolerances)
- Interpret symbols, notes, and specification
- Identify material requirements
- Interpret drawings to determine the proper procedure to make the part

Machine Safety

Objectives:

- Read and properly interpret various shop prints
- Interpret and use cam prints
- Interpret and use gear prints
- Read and understand an assembly drawing and bill of materials
- Read simple sheet metal drawings

Jobs, Companies, and the Economy—Basic Concepts for the Employee

Objectives:

- Identify the height, width, and length dimensions of a drawing
- Interpret dimensions on angles, arcs, fillets, rounds, holes, and chamfers
- Interpret the surface finish symbols for roughness, waviness, and lay

Quality Concepts: Terminology

Objectives:

- Tell the position method from the bracket method of dual dimensioning
- Identify the three general classes of fit
- Interpret unilateral and bilateral tolerances
- Interpret the various symbols and notations used on drawings

Common Hand Tools, Part 1

Objectives:

- Tell one type of section from another
- Interpret the various types of sections
- Interpret drawings using simplified drafting methods

Common Hand Tools, Part 2

Objectives:

- Familiarize yourself with the nature of bench work
- Familiarize yourself with wrenches, hammers, pliers, and screwdrivers
- Familiarize yourself with punches, twist drills, reamers, and broaches
- Familiarize yourself with saws, chisels, and snips
- Familiarize yourself with finishing and grinding tools

Precision Measuring Instruments, Part 1

Objectives:

- Identify threaded fasteners
- Describe thread systems
- Describe hole preparation for threaded fasteners
- Identify mechanical fasteners
- Describe rivets
- Describe keys
- Describe pins
- Familiarize yourself with threading with hand tools

Electric Drilling and Grinding Tools

Objectives:

- Describe tolerance, allowance, clearance, and fit
- Describe installation of machine components
- Describe babbitting
- Familiarize yourself with cutoff saws
- Familiarize yourself with soldering
- Familiarize yourself with brazing

Power Cutting Tools

Objectives:

- Explain the difference between accuracy and precision
- Define standard, the Rule of 10, and traceability
- Describe Abbe's error
- Describe how to use a number of tools for measuring dimensions
- Read a vernier scale
- Demonstrate the skill to work with both English and metric dimensions and with their abbreviations
- Convert between millimeters and inches

Pneumatic Tools

Objectives:

- Properly read standard and metric micrometers
- Read a vernier micrometer
- Choose special micrometers appropriately for various measuring tasks
- Recognize five kinds of depth and height gages and demonstrate the ability to read a depth gage
- Read the scale on a vernier bevel protractor
- Explain the uses of many kinds of indicators and gages in shopwork
- Describe how to minimize cosine error when using dial test indicators

Plumbing and Pipe-Fitting Tools

Objectives:

- Explain the use of optical comparators and toolmaker's microscopes
- Recognize the setup and operation of an optical alignment system—including laser and alignment telescopes
- Understand the use of digital readout gauges, and the use of both absolute and incremental measuring
- Recognize the uses for in-process and post-process gauging, including video inspection and CNC tool presetters
- Understand the use of hardness testers and video material testing
- Recognize the uses for modern nondestructive material testing, including magnetic particle inspection and ultrasonic testing

Electricians' Tools

Objectives:

- Measure using both English and metric units of length
- Calculate the perimeters of rectangles, squares, and triangles
- Calculate the areas of objects such as rooms or machine bases
- Calculate the circumference of circular objects such as pipes or tanks
- Measure distances using rigid and flexible rules, thickness gages, and screw pitch gages
- Make precise measurements using vernier calipers and micrometers

Tool Grinding and Sharpening

Objectives:

- Conclude how the economy will affect you as a consumer and as an employee
- Explain the concept of competition and how a business must react to market demands
- Evaluate how government policies affect the amount of saving and investing within an economy
- Defend the use of a flexible and empowered workforce in making a business more competitive
- Explain various economic measuring tools such as the inflation rate, the unemployment rate, and the GDP
- Appraise the current status of American labor in general and the status of American labor unions in particular
- Recognize how you as an employee or as an employer must compete in an increasingly international marketplace

Woodworking Hand Tools

Objectives:

- Define quality and total quality management, using examples
- Describe how quality has evolved to where it is today
- Explain several motivations for quality improvement
- Describe how quality-conscious organizations have changed for the better
- Assess quality-consciousness in individuals and organizations
- Explain how some familiar business practices have led to TQM and how certain other common practices have gotten in the way of TQM
- Name some successful results of TQM programs

Routers, Power Planers, and Sanders

Objectives:

- Identify industrial metals by their names and chemical symbols
- Define in basic terms the characteristics and properties of metals
- Explain the various metal-processing methods used in producing industrial metals
- Explain how metals are extracted from their ores found in the earth and then refined

Jacks, Hoists, and Pullers

Objectives:

- Identify the features of a blast furnace
- Recognize cast irons by their fractures and other properties
- Describe the major steelmaking processes
- Discuss the hot-working and cold-working methods used to shape steel
- Classify the types of steel, according to both processing method and carbon content
- Relate certain grade numbers to the types of steel they identify

Preventive Maintenance

Objectives:

- Describe the function of inspection and scheduled maintenance as the basis of preventive maintenance
- Explain why preventive maintenance is performed and how it's scheduled
- Identify those within industry who should be part of preventive maintenance planning and execution
- Discuss the causes, effects, and goals of a successful preventive maintenance program
- Explain how a computerized preventive maintenance program can be developed and implemented

Introduction to Print Reading

Objectives:

- Describe the basic format for conveying technical information in a drawing
- Identify and interpret the various drawing views used in technical drawings
- Understand how information is organized in notes and title blocks
- Interpret the different line types used in drawings
- Understand the concept of the drawing scale and how it affects information shown in the drawing

Print-Reading Symbols and Abbreviations

Objectives:

- Interpret the most common abbreviations used on drawings
- Understand and interpret the various symbols and notations used on drawings for electrical, architectural, mechanical, and other types of applications
- Recognize how symbols are used to show standard materials, parts, and assemblies
- Interpret thread specifications
- Understand some common symbols used in machining prints
- Recognize common symbols found on hydraulic and pneumatic prints

Dimensioning and Tolerancing

Objectives:

- Know the international standards and conventions that apply to drawings
- Understand how different numbering systems were developed and how they're applied to prints and drawings
- Understand dimensions and tolerances on drawings that describe geometries of parts and assemblies
- Recognize and interpret common symbols and nomenclature used in geometric dimensioning and tolerancing (GD&T)
- Understand how GD&T uses symbols to explain and describe the designer's intent, and eliminate misinterpretation of the print

Print Reading Applications

Objectives:

- Understand standard drawing formats that give information about part titles, part numbers, dimensional standards, revisions, and materials
- Explain how various components shown on prints are connected or related to each other
- Obtain important information from a drawing about quantities, materials, assembly processes, or dimensions
- Visualize the three-dimensional parts and assemblies represented by two-dimensional drawings

Building Drawings

Objectives:

- Identify the various kinds of building drawings
- Compare elevations, plans, and sections
- Match the symbols used on drawings with the various building materials they stand for
- Interpret the explanations and abbreviations used on building drawings
- Read steel and concrete structural drawings

Electrical Drawings and Circuits

Objectives:

- Identify electrical construction drawings, schematics, and wiring diagrams
- Interpret various electrical symbols
- Read standard abbreviations used in electrical diagrams
- Tell if a diagram is a block diagram, a schematic diagram, or a wiring diagram
- Compare closed circuits, open circuits, grounded circuits, and short circuits

Electronic Drawings

Objectives:

- Identify and interpret the various electronics symbols used on drawings
- Identify and interpret the various types of drawings used in the electronics field

Hydraulic and Pneumatic Drawings

Objectives:

- Identify and interpret graphic symbols for lines, flows, and reservoir
- Identify and interpret pump and valve symbols
- Identify and interpret fluid circuit and air circuit components
- Identify and interpret graphical, circuit, cutaway, pictorial, and combined diagrams

Piping: Drawings, Materials, and Parts

Objectives:

- Define the term "piping drawings"
- Recognize on sight plans, elevations, and sectional views
- Identify a view by its placement on a drawing
- List what working drawings include
- Evaluate whether or not a freehand sketch serves its intended purpose
- Interpret the standard symbols and abbreviations used on piping drawings and diagrams
- "Read" the color coding on piping in industrial and power plants
- Interpret dimensions marked on piping drawings
- Define piping plans, diagrams, plot plans, general arrangements, and details, and state the use of each
- List the various materials used for pipe and give the characteristics of pipe of each material
- Classify pipe by material, construction, end condition, strength, and size
- Recognize the various types of valves and identify their use and construction
- List and identify various kinds of pipe hangers and supports and other piping accessories

Welding Symbols

Objectives:

- Identify by name the welding processes commonly used in plant maintenance work
- Name the best welding processes for a given welding job
- Identify by sight the basic joint and groove designs used in welding
- Identify by sight the basic types of welds, and describe their uses
- Interpret the weld symbols most often found in the drawings used in plant maintenance work

Sheet Metal Basics

Objectives:

- Identify sheet metal of known material and thickness by gage and weight
- Figure allowances for bends, circumferences, seams, locks, and edges
- Know when and where to cut relief radii
- Catalog and identify by sight the various seams, locks, and edges
- Name and describe the major tools and machines used in sheet metal working
- Explain how large fittings can be constructed
- List the characteristics of PVC and PVF sheet and laminates

Sketching

Objectives:

- Use the right techniques for sketching straight and curved lines, and circles and arcs
- Make, with practice, multiview sketches of simple objects that accurately show all the details of the objects
- Dimension sketches of simple machine parts with enough detail that parts can be made
- Draw, with practice, realistic picturelike sketches of objects that have simple rectangular and circular shapes

Metal Processing

Objectives:

- Identify industrial metals by their names and chemical symbols
- Define in basic terms the characteristics and properties of metals
- Explain the various metal-processing methods used in producing industrial metals
- Explain how metals are extracted from their ores found in the earth and then refined

Ferrous Metals

Objectives:

- Identify the features of a blast furnace
- Recognize cast irons by their fractures and other properties
- Describe the major steelmaking processes
- Discuss the hot-working and cold-working methods used to shape steel
- Classify the types of steel, according to both processing method and carbon content
- Relate certain grade numbers to the types of steel they identify

Nonferrous Metals

Objectives:

- Explain how the various metals are extracted from their ores
- Describe how the addition of certain elements affects the mechanical properties of the base metals
- Select the metal alloy most suitable for a given job
- Recognize whether a copper alloy is a brass or a bronze

Identification of Metals

Objectives:

- Identify a metal by making a file test, magnetic test, temperature test, chip test, or spark test
- Find the hardness of a metal, by using a Brinell, Rockwell, monotron, Vickers, Herbert-pendulum, or scleroscope hardness-testing machine

Reading Architects' Blueprints Part 1

Objectives:

- Interpret plans, elevations, sections, details, surveys, and shop drawings
- Identify symbols and abbreviations on drawings for materials like wood, stone, and concrete

Reading Architects' Blueprints Part 2

Objectives:

- Read and interpret the general work and plot plan for a large contemporary residence
- Understanding the purpose of the various rooms in a residential drawing and the elevations and views of natural finished grades

Reading Architects' Blueprints Part 3

Objectives:

- Review architects' drawings of an apartment building in New York City

Properties of Materials

Objectives:

- Describe the types and effects of stress on a body
- Identify the characteristics of cohesive properties in materials
- Describe the relationships of working stress on different materials
- Explain and calculate safe load
- Identify the types of fasteners used with structural steel
- Describe how stress impacts rope, wire, and chains
- Identify the properties of metals

Operation Preliminary to Building

Objectives:

- Discuss the materials that make up the Earth's surface
- Examine soils and perform seismic analysis
- Measure soil density and explain principles of compaction
- Stabilize soils using mineral aggregates, salt, cement, bituminous materials, and oil
- Test and identify the bearing capacity of various materials in the Building Code of the City of New York
- Survey a site
- Stake out a building with and without a transit
- Differentiate among an engineer's level, builder's level, transit, and transit level

Concrete Construction Part 1

Objectives:

- Define the composition, use, and factors to produce quality concrete
- Discuss cements and aggregates
- Identify advantages of controlled concrete and the process of creating it
- Describe wood forms, wood and plywood forms, and prefabricated forms
- Recall the requirements for reinforcing steel
- Mix and convey concrete
- Cure quality concrete

Concrete Construction Part 2

Objectives:

- Identify problems using concrete in hot and cold weather
- Explain how to place, cure, and finish concrete floors
- Obtain finishes for formed concrete
- Identify special concretes
- Describe tilt-up construction and prestressed concrete
- Test concrete and identify problems using concrete

Builder's Hardware

Objectives:

- Identify rough hardware, hinges, locks, and other door hardware

Builder's Hardware Part 2

Objectives:

- Identify window and transom hardware, cabinet hardware, and other miscellaneous hardware
- Select and Specify hardware for various projects

Linear Surveying

Objectives:

- Instruments for linear measurements
- Measurement of distances
- Simple field problems in linear surveying
- Survey of tract with tape

Leveling

Objectives:

- Define terms in leveling and the features of common engineer levels
- Describe and use various leveling rods
- Explain the general procedure to run a line of levels
- Test and adjust levels
- Perform mercurial and aneroid barometric leveling

Transit Surveying Part 1

Objectives:

- Set up, adjust, and use a transit to take accurate measurements in various surveying operations
- Measure the magnitude of a certain angle, given the true bearing of each line forming that angle
- Determine the true azimuth of a line when the true azimuth of a second line and the angle between them are known
- Define various terms, such as azimuth, magnetic bearing, and declination, used in transit surveying
- Calculate the true bearing of a particular line when you know the true bearing of a second line and the deflection angle between the lines
- Given the declination at a certain point and the true bearing of a line extending from that point, find the magnetic bearing of a second line passing through the same point
- Find both the true azimuth and the back azimuth of a line when its true bearing is known
- Take the reading on either the horizontal or the vertical limb of an optical-reading theodolite
- Compute the true back bearing of a certain line when you know the magnetic azimuth of a second line and the magnetic declination at the vertex of the two lines
- Determine the true bearing of a line, given its magnetic azimuth and the declination at its end point
- Calculate the angle between two lines whose magnetic bearings are known
- Given two lines with a known deflection angle between them, find the true bearing of the second line when the true azimuth of the first line is known

Transit Surveying Part 2

Objectives:

- Mark transit point for a survey
- Read both verniers when the telescope of a transit is rotated in azimuth, with the upper plate clamped and the lower plate unclamped
- Find the two vertical angles, given the index error of the transit and two readings on its vertical limb
- Define precision in relation to surveying instruments
- Set up a transit to find a line of sight
- Calculate the magnetic bearing of a line whose true azimuth and magnetic declination are known
- Apply the methods of repetition, triangulation, and double centering
- Find the elevation of a point when you know the height of the transverse axis of the transit and the readings on the horizontal cross line and vertical limb
- Determine the azimuth of a line using a transit
- Define index error, deflection angle, and local attraction
- Differentiate between true azimuth, magnetic declination, and magnetic bearing
- Measure angles in both a clockwise and a counterclockwise direction
- Given two points with observed readings along their lines of sight, determine the angle between the points, using a transit with the usual graduations on its horizontal limb

Transit Surveying Part 3

Objectives:

- Latitudes and departures
- Balancing closed traverses
- Plotting traverses
- Areas of tracts of land

City Surveying Part 1

Objectives:

- General features of city surveys
- Triangulation for horizontal control
- Base lines in triangulation
- Measurement of angles in triangulation
- Adjustment of angles and sides of triangle
- Other calculations in triangulation

City Surveying Part 2

Objectives:

- General features of control traverses
- State plane-coordinate systems
- Calculations for single traverse
- Adjustment of traverse net
- Field work in vertical-control surveys
- Corrections to difference in elevation

City Surveying Part 3

Objectives:

- Adjustment of level net
- Construction and maintenance surveys
- City maps and records
- Projections for maps

Highway Curves Part 1

Objectives:

- Locating ends of simple curve
- Locating points on a simple curve by deflection angles
- Other methods of locating points on a simple curve
- Special problems relating to simple curves

Highway Curves Part 2

Objectives:

- Compound and reverse curves
- Transition curves
- General properties of transition curves
- Field layout of spiraled curves
- Spiral joining two curves
- Vertical parabolic curves

Earthwork

Objectives:

- Field measurements to locate the center line for a highway
- Computation of volume of earthwork on straight portions of highways and on curves
- Disposal of cut and fill, changes in volume of excavated material, and using a mass diagram

Highway Embankments and Subgrades

Objectives:

- Foundations for embankments
- Construction of embankments
- Classification of soils
- Treatment of embankments and subgrades

Highway Drainage

Objectives:

- Subdrains
- Surface drainage channels
- Culverts

Low-Cost Road Surfaces Part 1

Objectives:

- Materials for low-cost roads
- Treatments of natural subgrade
- Untreated surfacings
- Bituminous surface treatments
- Stabilized soil-bound road surfaces

Hard Pavements Part 1

Objectives:

- List the advantages and disadvantages of concrete pavements
- Describe the elements affecting concrete pavement designs
- List the factors that must be considered when designing concrete pavements
- Describe the processes involved in constructing continuously reinforced concrete pavement (CRCP)
- Discuss types of cement, other ingredients used to prepare a concrete mixture, and process of manufacture
- Describe the steps necessary to construct concrete pavement
- Explain the purposes for having points in pavements
- Describe machine and hand finishing of concrete pavements
- Describe the reasons for and methods of curing concrete
- Describe the steps that should be taken to maintain and repair concrete

Hard Pavements Part 2

Objectives:

- Identify the source of bitumen and define its variations
- Describe four basic design methods for determining pavement thickness
- Explain the functions of geotextiles and identify the types of geosynthetics
- Explain the importance of cost estimates and specifications
- Describe the classification and analysis of hot-mix asphalt paving mixture
- Explain how to determine an economical blend of aggregates and a desired quantity of bituminous material
- List the parts of a hot-mix, or asphalt mixing plant and explain the function of each part
- Identify the correct order of the steps for placing and compacting bituminous mixtures and explain these steps
- Explain how defects in hot-mix paving are corrected

Production of Concrete Part 1

Objectives:

- Materials for Concrete
- Tests of Cement

Production of Concrete Part 2

Objectives:

- Preparation of Aggregates
- Tests of Aggregates
- Proportioning Concrete Mixtures

Production of Concrete Part 3

Objectives:

- Methods of providing durable concrete
- Mixing ingredients of concrete
- Tests of concrete
- Handling mixed concrete
- Concreting under special conditions

Field Methods in Concrete Construction Part 1

Objectives:

- Raw materials
- Manufacture of concrete
- Handling mixed concrete
- Treating concrete in place

Field Methods in Concrete Construction Part 2

Objectives:

- Prestressed concrete
- Lift-slab method
- Tilt-up construction
- Organization for concrete construction

Mechanics of Materials Part 1

Objectives:

- Stress and deformation
- Investigation and design of simple parts
- Riveted joints
- Welded joints
- Other fastening devices

Mechanics of Materials Part 2

Objectives:

- Beam loads and supports
- Cantilever, simple, and overhanging beams
- Continuous and fixed-end beams

Mechanics of Materials Part 3

Objectives:

- Stresses in beams
- Torsion in members
- Theory of column design

Design of Steel Building Frames Part 1

Objectives:

- General features of rolled shapes and connections
- Conventional symbols for connecting devices
- Strength of tension member
- Strength of riveted connections
- Strength of bolted connections
- Strength of welded connections

Design of Steel Building Frames Part 2

Objectives:

- Introductory explanations
- Specified allowable stresses in beams
- Actual stress and deflections in beams
- Investigation and design of beams
- Beam connections

Design of Steel Building Frames Part 3

Objectives:

- Composite floor construction
- Steel columns
- Details of steel columns

Plate Girders for Buildings

Objectives:

- Preliminary explanations
- Investigation of cross section of girder
- Design of welded plate girder

Erection of Steel Building Frames

Objectives:

- Define the general features of erection, the erector's program, the procedure in estimating the cost of erection, the information given by erection plans, and the shipment of the steel
- Identify ropes, slings, blocks, gin poles and pole derricks, stiff-leg and guy derricks, and power cranes
- Hoist heavy parts to relatively great heights
- Discuss the advantages of high-strength bolts over rivets and how to install them

Reinforced Concrete Design Part 1

Objectives:

- Identify the properties of concrete and steel in reinforced concrete and the strength and modulus of elasticity of concrete
- Differentiate between working stress design and strength design
- Calculate the bending moments and shears in continuous beams of reinforced concrete
- Discuss basic assumption in strength design and general formulas of resisting moment of a singly reinforced beam
- Describe the procedure for determining the width, depth, and amount of reinforcement for a rectangular beam that's simply supported, singly reinforced, and required to carry specified loads
- Determine the maximum load that can be carried by an existing beam
- Design or investigate a beam in which reinforcement is provided to resist both tensile stresses and compressive stresses
- Design and investigate a T-shaped cross section
- Design reinforcement in a continuous beam
- Consider the probable deflection of a reinforced-concrete beam

Reinforced Concrete Design Part 2

Objectives:

- Identify shear stresses in beams with the general arrangement of reinforcement to prevent diagonal cracks in the concrete
- Apply the working stress method to the design of a singly reinforced rectangular beams, doubly reinforced rectangular beams, and T-beams
- Describe one-way slabs and the procedures to determine the required thickness of a slab and the size and spacing of bars needed for principal and secondary reinforcement

Reinforced Concrete Design Part 3

Objectives:

- Discuss the unsupported and effective lengths of a column, the minimum specified eccentricity of the vertical load on a column, the slenderness ratio of a column, and the general requirements of the longitudinal reinforcement and the lateral reinforcement in a column
- Describe the balanced condition for a rectangular, square, or circular column
- Determine the capacity of a tied column or spiral column
- Determine the flexural stiffness and the magnified moment for a long column

Structural Design of Pipe Culverts

Objectives:

- Identify the common materials and how to install pipe culverts
- Design rigid pipe culverts
- Design flexible pipe culverts

Foundations and Piling

Objectives:

- Identify foundation materials on the Earth's surface
- Describe the distribution of pressure on a foundation bed subjected to a load and the method of estimating the bearing capacity of a soil from loads and corresponding settlements
- Explain how to remove loose rock and dry granular material, the purpose of sheet piling, the use of cofferdams and caissons of various types, the general features of excavating equipment, and the characteristics of explosives
- Describe the types of piles, the apparatus for driving piles, and the general procedures in pile driving
- Estimate supporting power of bearing piles
- Protect timber piles against damage and decay
- Construct concrete bearing piles and use steel piles

Steel Rood Trusses Part 1

Objectives:

- Describe the general features of roof trusses
- Identify the different kinds of loads on roof trusses
- Identify the types of reactions at support trusses
- Recognize the kinds of axial forces on truss members
- Construct graphic representations of forces on truss members
- Calculate axial forces on truss members

Steel Rood Trusses Part 2

Objectives:

- Describe the main members of trusses and their general properties
- Differentiate among various panel points of flat trusses and fink truss
- Understand the design of main truss members
- Understand the design of connections at panel points

Steel Rood Trusses Part 3

Objectives:

- Describe design elements of roof covering and purlins
- Explain the design of roof trusses, including the typical fink truss and the typical flat truss

Fireproofing of Buildings

Objectives:

- Explain the need for fire-resistive construction in all builds, the resistance of various types of construction to fire and how they're tested and measures
- Describe the properties of carious materials of construction and how some work in combination
- Identify the function of the structural frame and the various methods of fireproofing frame components
- Construct fireproof partitions
- Explain the purpose and procedure of fireproofing openings like doors and windows
- Describe different types of fire extinguishing equipment