



ELECTRONIC SYSTEMS TECHNICIAN

Materials and Equipment

Level One

MODULE 33101-04 – INTRODUCTION TO THE TRADE

- Overhead projector and screen
- Transparencies
- Blank acetate sheets
- Transparency pens
- Whiteboard/chalkboard
- Markers/chalk
- Pencils and scratch paper
- Appropriate personal protective equipment
- Copies of the latest edition of the *National Electrical Code*[®]
- Examples of building codes and cabling standards
- Copies of licensing examination test questions (if applicable in your state)
- A sample company policy or standard
- Copies of the following types of documents:
 - Contract
 - Work statement
 - Bill of materials
 - As-built diagrams
 - Time sheets
 - Job sheets
 - Floor plans
- Contren*[®] EST Levels Two, Three, and Four
- Sample test instruments:
 - Analog meter
 - Telephone test set
 - LAN cable tester
 - Tone generation/amplifier probe kit
- Cable stripping and termination tools:
 - Coaxial cable crimp tool and replacement die
 - Coaxial cable stripper
 - Bix tool blade
 - Punch-down tool
- Module Examinations
- Performance Profile Sheets

MODULE 33102-04 – CONSTRUCTION MATERIALS AND METHODS

Overhead projector and screen

Transparencies

Blank acetate sheets

Transparency pens

Whiteboard/chalkboard

Markers/chalk

Pencils and scratch paper

Appropriate personal protective equipment

MSDS for pressure-treated wood

Rulers or measuring tape

Samples of typical construction materials:

- Dimension lumber

- Plywood and building boards

- Engineered wood products

- Concrete blocks

- Building brick

- Metal studs

- Mechanical firestop devices

- Firestopping materials

Wooden studs, insulation, wallboard, baseboard, and tools to build partition walls

Components of a wood or metal framing system or an illustration of a framing system

Power screwdriver

Operator's manuals for selected power tools

Drill

Rotary hammer

Selection of drill bits and hole saws

Jig saw and blades

Reciprocating saw and blades

Power cutout tool

Circle cutter

Metal stud punch

Scrap pieces of lumber, metal studs, gypsum wallboard, and plywood for drilling and cutting

Hammers

Finishing nails

Joint compound, plaster or spackling compound, caulk, and putty knife

Nail bar

Stud finder

Contren® Carpentry Level One Video 1: Framing Floors and Sills (optional)

Contren® Carpentry Level One Video 2: Wall Framing (optional)

Contren® Carpentry Level One Videos 3 and 4: Roof Framing Parts 1 & 2 (optional)

Contren® Carpentry Levels Three and Four Video 1: Interior Carpentry: Metal Stud Construction/Drywall (optional)

Contren® Carpentry Levels Three and Four Video 2: Interior Carpentry: Ceilings/Cabinets (optional)

Videocassette recorder (VCR)/TV set (optional)

Module Examinations

Performance Profile Sheets

MODULE 33103-04 – PATHWAYS AND SPACES

Overhead projector and screen

Transparencies

Blank acetate sheets

Transparency pens

Whiteboard/chalkboard

Markers/chalk

Pencils and scratch paper

Appropriate personal protective equipment

Copies of the latest edition of the *National Electrical Code*[®]

Sections of various types of conduit:

EMT with compression couplings or connectors	ENT and couplings IMC
Rigid metal GRC	LFNC EB and DB PVC
Plastic-coated GRC Aluminum	Flexible metal Inner duct

Various conduit couplings and connectors

Type C, Type L, Type T, and Type X conduit bodies

Threaded waterproof hub

Insulated bushing

Offset nipples

Metal boxes

PVC box

Concrete outlet boxes and extension rings

Bushings and locknuts

Sealing fittings

Low-voltage boxes and faceplates

Various straps and ties

Beam clamps

J-hooks

Bridle rings

D-rings and half D-rings

Mushroom posts

Standoff support

Wireway components:

Connectors	Crosses
End plates	Elbows
Closing plates	Nipples
Tee fittings	Slip fittings

Wireway hangers:

Suspended	Trapeze
Gusset	Center-hung support

Hand tools necessary for box installation

Metal boxes and conduit for Performance Task 1

Mounted drywall, cut-in boxes, and inner ducts for Performance Task 3

Contren[®] *Carpentry Levels Three and Four Video 2: Interior Carpentry: Ceilings/Cabinets* (optional)

Videocassette recorder (VCR)/TV set (optional)
Copy of *ANSI/TIA/EIA-569*
Module Examinations
Performance Profile Sheets

MODULE 33104-04 – FASTENERS AND ANCHORS

Overhead projector and screen

Transparencies

Blank acetate sheets

Transparency pens

Whiteboard/chalkboard

Markers/chalk

Pencils and scratch paper

Personal protective equipment:

Dust mask

Hearing protection

Eye protection

Hard hat

Work gloves

Work boots or safety shoes

Copies of the latest edition of the *National Electrical Code*[®]

Assorted threaded fasteners:

Cap screws

Setscrews

Machine screws

Stud bolts

Machine bolts

Nuts

Washers

Assorted non-threaded fasteners:

Retainers

Blind rivets

Keys

Tie wraps

Pins

Assorted special threaded fasteners:

Eye bolts

Anchor bolts

J-bolts

Assorted screws:

Wood screws

Lag screws and shields

Concrete/masonry screws

Deck screws

Drywall screws

Thread-forming screws

Thread-cutting screws

Drive screws

Mechanic's tool box with an assortment of wrenches, screwdrivers, hammers, and other small tools

Safety wire

Torque wrenches

Rivet gun and rivets

Drills/drivers and assorted drill bits

Hammer-driven tools and related pin and stud fasteners

Powder-actuated tool, powder charges, and related pin and stud fasteners

Assorted mechanical anchors and associated anchor setting tool(s):

Wedge	Lead (caulk in)
Stud bolt	Screw (fiber, lead, and plastic)
Sleeve	Self-drilling
One-piece	Toggle bolts
Hammer-driven	Sleeve-type
Drop-in	Wallboard
Expansion shields	Metal drive-in

Scrap pieces of concrete, masonry, wallboard, plywood, and wood

Drywall of different thicknesses

Plywood of different thicknesses

Bag of concrete mix or similar object to use as a weight

Brick or concrete block

Module Examinations

Performance Profile Sheets

MODULE 33105-04 – JOB-SITE SAFETY

Overhead projector and screen

Transparencies

Blank acetate sheets

Transparency pens

Whiteboard/chalkboard

Markers/chalk

Pencils and scratch paper

Voltmeter or voltage tester

MSDS for solvents

MSDSs for various types of batteries

Ground fault circuit interrupter (GFCI)

Lockout/tagout devices and labels

Copies of the latest edition of the *National Electrical Code*[®]

OSHA Electrical Safety Guidelines (pocket guide)

Copies of *29 CFR 1910.335(a) Personal Protective Equipment*

Copies of *29 CFR 1910/1926*

Various types of personal protective and safety equipment:

Rubber gloves	Face shields
Insulating blankets	Chemical apron
Hot sticks	Respirators
Fuse pullers	Harness and lifeline
Shorting probes	Air monitoring equipment (optional)
Safety glasses	

Access to an eye wash station

Operator's manuals for various hand tools

The National Safety Compliance video: *High Voltage Electrical Safety* (optional)

Videos on confined-space entry (optional)

Television/videocassette player (optional)

Module Examinations

Performance Profile Sheets

MODULE 33106-04 – CRAFT-RELATED MATHEMATICS

Overhead projector and screen
Transparencies
Blank acetate sheets
Transparency pens
Whiteboard/chalkboard
Markers/chalk
Pencils and scratch paper
Copies of Worksheets 1 through 7
One cup of sugar and a measuring cup
A small scale and weights (metric and English system)
Rulers (metric and English)
Thermometers (Fahrenheit and Celsius)
Ice water
Hot tap water
Scientific calculators
Module Examinations
Performance Profile Sheets

MODULE 33107-04 – HAND BENDING OF CONDUIT

Overhead projector and screen
Transparencies
Blank acetate sheets
Transparency pens
Whiteboard/chalkboard
Markers/chalk
Pencils and scratch paper
Appropriate personal protective equipment
Copies of the latest edition of the *National Electrical Code*[®]
Various pieces of conduit
One piece of EMT per trainee
PVC pieces
PVC fittings
PVC cement
MSDS for PVC cement
Cutting oil
Shop towels
Tape measure
Hickey with instruction manual
Hand bender with instruction manual
Calculator
Hacksaw
Mitre box
Pocket knife
Torpedo level or square
Pipe vise
Pipe cutter

Reamer
Conduit dies and die heads
Hand-operated threader
Thread gauge
Portable power drive (optional)
Sandbox or drip pan
Jack Benfield's conduit bending videos: *Bending Made Simple* and *Bending Techniques* (optional)
Tom Henry's conduit bending video: *Conduit Bending* (optional)
Videocassette recorder (VCR)/TV set (optional)
Module Examinations
Performance Profile Sheets

MODULE 33108 - LOW-VOLTAGE CABLING

Overhead projector and screen
Transparencies
Blank acetate sheets
Transparency pens
Whiteboard/chalkboard
Markers/chalk
Pencils and scratch paper
Appropriate personal protective equipment
Samples of various types of wire and insulation
Hand calculator
Standard wire gauge
Cable caddy
Radios or telephones
Gloves
Manual fish tape
String blower/vacuum
Pull lines or ropes
Extension cords with GFCI protections
Capstan-type rope puller
Short ropes for temporary tie-offs
Swivels
Basket-grip pullers
Other types of wire grips
Reel anchor
Reel jacks
Reel brakes
Cable cutters
50' measuring tape
Bullwheels
Conduit swabs
Mandrel
Conduit brush
Pistons
Pulleys

Telescoping pole with hook
Power drills and drill bits (spade bits, bore bits, and flex bits)
Stud locators
Video scanners
Wiring and pipe locators
Plaster cutters (power or hand)
Copy of the latest version of the *National Electrical Code*[®]
Samples of various conductors
Samples of multi-mode and single-mode optical fiber cables
Samples of cables with NEC[®] classification markings
Samples of UTP, UTC, STP, STP-A, and ScTP communications cables and patch cords
Samples of coaxial cable (RG-59, RG-6, RG-11, RG-8, and RG-58)
Various sizes of cable on reels or in boxes, pay-out packs, or reels-in-a-box
Typical residential building plans showing cable pathways and head end equipment
Typical residential conduit, supports, and outlets
Copies of telephone wiring installation standards
Videocassette recorder (VCR)/TV set (optional)
Copies of the Quick Quiz
Module Examinations
Performance Profile Sheets

Level Two

MODULE 33201-05 – DC CIRCUITS

- Overhead projector and screen
- Transparencies
- Blank acetate sheets
- Transparency pens
- Whiteboard/chalkboard
- Markers/chalk
- Pencils and scratch paper
- Appropriate personal protective equipment
- Various types of resistors
- A voltmeter and instruction manual
- An ammeter and instruction manual
- An ohmmeter and instruction manual
- Copies of the Quick Quiz
- Module Examinations
- Performance Profile Sheets

MODULE 33202-05 – AC CIRCUITS

- Overhead projector and screen
- Transparencies
- Blank acetate sheets
- Transparency pens
- Whiteboard/chalkboard
- Markers/chalk
- Pencils and scratch paper
- Appropriate personal protective equipment
- Calculator
- Common capacitors
- Inductors, resistors, capacitors, power sources, and wiring to build RL, RC, RLC, and LC circuits
- Voltmeter
- Transformers
- Copies of the Quick Quiz
- Module Examinations
- Performance Profile Sheets

MODULE 33203-05 – SEMICONDUCTORS AND INTEGRATED CIRCUITS

Overhead projector and screen
Transparencies
Blank acetate sheets
Transparency pens
Whiteboard/chalkboard
Markers/chalk
Pencils and scratch paper
Appropriate personal protective equipment
24V transformer with a plug and power cord
Filter capacitor
Oscilloscope
DC load resistance
Selection of diodes, LEDs, transistors, and SCRs
Multimeter
Grounding strap
Selection of schematic and logic diagrams
Selection of printed circuit boards, sealed components, integrated circuits, and microprocessors
Pushbutton
Components and wire to connect basic test circuits
Module Examinations
Performance Profile Sheets

MODULE 33204-05 – BASIC TEST EQUIPMENT

Overhead projector and screen
Transparencies
Blank acetate sheets
Transparency pens
Whiteboard/chalkboard
Markers/chalk
Pencils and scratch paper
Appropriate personal protective equipment
Grounding strap
Various types of test instruments, including:
 Analog multimeter Line frequency meter
 Clamp-on ammeter Time domain reflectometer
 Oscilloscope Continuity tester
 Wattmeter Recording instruments
 Megohmmeter RF analyzer meter
 Frequency counter
Power supplies, circuit boards, or equipment used as a source of test voltages and currents
Signal or function generator or equipment that is a source of test waveforms
Batteries
Resistors
Good and bad motors, transformers, cables, and so forth, for making resistance measurements

Components and wire to connect basic test circuits
Assortment of cables for test purposes
Module Examinations
Performance Profile Sheets

MODULE 33205-05 – POWER QUALITY AND GROUNDING

Overhead projector and screen
Transparencies
Blank acetate sheets
Transparency pens
Whiteboard/chalkboard
Markers/chalk
Pencils and scratch paper
Appropriate personal protective equipment
Access to an AC power distribution system
Copies of *NEC Article 250*
Access to a commercial telecommunications system
Copy of the NEC®
Access to lighting protection system installed in a high-rise building
Isolation transformers
Surge protection devices
Metal-oxide varistors
Voltage regulator
Power line conditioner
Harmonic noise suppression filter
AC motor-generator set
Engine-driven AC generator set
Uninterruptible power supplies
Full-wave and switching power supplies and suitable loads
Oscilloscope and probes
Multimeter (VOM or DMM) and test leads
Various lead acid, alkaline, and nickel cadmium storage batteries
Battery charger
Electrostatic discharge wrist strap
ESD sensitive printed circuit board
Ground resistance tester and accessories kit
GFCI circuit breaker and receptacles
Megohmmeter
Time domain reflectometer
Shielded cable
Examples of manufacturer's catalogs/data sheets for system protection and conditioning devices
Examples of manufacturer's catalogs/data sheets for DC power supplies
Examples of manufacturer's catalogs/data sheets for batteries
Module Examinations
Performance Profile Sheets

MODULE 33206-05 – INTRODUCTION TO ELECTRICAL BLUEPRINTS

Overhead projector and screen

Transparencies

Blank acetate sheets

Transparency pens

Whiteboard/chalkboard

Markers/chalk

Pencils and scratch paper

Appropriate personal protective equipment

Set of electrical blueprints and written specifications

Architect's scale

Engineer's scale

Standard 12-inch ruler

Metric ruler

Electronic scale ruler

Bench vise

Golf ball

Hacksaw

Module Examinations

Performance Profile Sheets

MODULE 33207-05 – SWITCHING DEVICES AND TIMERS

Overhead projector and screen

Transparencies

Blank acetate sheets

Transparency pens

Whiteboard/chalkboard

Markers/chalk

Pencils and scratch paper

Appropriate personal protective equipment

Samples or pictures of the following devices:

Single-pole switch	Machine control relay
Three-way switch	Solid-state relay
Double-pole switch	Dashpot timer relay
Float switch	Pneumatic timer
Pneumatic switch	Time clock or timer relay
Limit switch	Solid-state timer
SCR	Photocell switcher
Reed relay	Solar cells
General purpose relay with plug in base	Motion detectors Proximity switch

Specification sheets and/or manufacturer's product catalogs/data sheets for various switches, relays, timers, time clocks, and photoelectric devices

Test light

Ohmmeter

Wiring, relays, photocells, motion detectors, loads, and switches to build simple circuits

Module Examinations

Performance Profile Sheets

MODULE 33208-05 – WIRE AND CABLE TERMINATIONS

- Overhead projector and screen
- Transparencies
- Blank acetate sheets
- Transparency pens
- Whiteboard/chalkboard
- Markers/chalk
- Pencils and scratch paper
- Appropriate personal protective equipment
- Various types of coaxial cable
- Coaxial cable connectors, including:
 - F-type connectors
 - BNC connectors
- Coaxial cable stripper
- Literature and instructions from connector manufacturers
- Crimping and assembly tools, including:
 - Punchdown tool
 - Plier-type crimping tool
 - Leveraged crimping tool
 - Modular plug crimping tool
- Multimeter
- Manufacturer's literature on communications/data network equipment
- Time-domain reflectometer
- Wire cutters
- Stripping tools
- Screwdriver
- Pliers
- Diagonal cutting tool
- Category 1 and 2 telephone wiring jacks and connectors
- Category 3 and higher cable
- Snap-in station outlet couplers
- Punchdown blocks
- Patch cord plugs
- Pre-assembled patch cords
- Wire/cable management devices
- Soldering iron
- Solder
- Soldering flux
- Desoldering pump
- ANSI/TIA/EIA-586A-compliant data communications cables
- Shielded twisted pair cable
- Workstation coupler plugs and jacks
- Compact 5e modules
- Surface-mount box
- Modular plugs
- Type 66 and 110 blocks and block plugs

IDC termination blocks
Cable management hardware
Crimp connectors for screw terminals
Splice-type crimp connectors
Wire nuts
Multipair punchdown/cutoff tools
Fiber-optic connectors
Module Examination
Performance Profile Sheets

MODULE 33209-05 – INTRODUCTION TO CODES AND STANDARDS

Overhead projector and screen
Transparencies
Blank acetate sheets
Transparency pens
Whiteboard/chalkboard
Markers/chalk
Pencils and scratch paper

Copies of the latest edition of the following ANSI/TIA/EIA Standards:

ANSI/TIA/EIA-568-B, Commercial Building Telecommunications Cabling Standard Plus Addenda 1 through 3, and Telecommunications Systems Bulletins TSB-67, TSB-72, and TSB-75

ANSI/TIA/EIA-569-B, Commercial Building Standards for Telecommunications Pathways and Spaces

ANSI/TIA/EIA-570-B, Residential Telecommunications Cabling Standard

ANSI/TIA/EIA-606, Administration Standard for the Telecommunications Infrastructure of Commercial Buildings

ANSI/TIA/EIA-607, Commercial Building Grounding and Bonding Requirements for Telecommunications

Copies of the latest IEEE Standards:

Standard 802.3, CSMA/CD Access Method

Standard 802.5, Token Ring Access Method

Standard 1394, Standard for a High Performance Serial Bus

Copy of the latest edition of the *International Building Code*®

Copy of the latest edition of the *National Building Code*®

Copy of the latest edition of the *Uniform Building Code*™

Copy of the latest edition of the *Standard Building Code*

Copy of the latest edition of the following NFPA Codes:

NFPA 5000, Building and Construction Safety Code™

NFPA 13, Standard for the Installation of Sprinkler Systems

NFPA 13D, Installation of Sprinkler Systems in One and Two-Family Dwellings and Manufactured Homes

NFPA 13R, Installation of Sprinkler Systems in Residential Occupancies Up to and Including Four Stories in Height

NFPA 70, National Electrical Code®

NFPA 72, National Fire Alarm Code

NFPA 101®, *Life Safety Code*®

NFPA 780, Standard for Installation of Lightning Protection Systems

Copy of the latest edition of *SCTE Standard ANSI/SCTE 74 2003, Specifications for Braided 75 Ohm Flexible RF Coaxial Drop Cable*

Copies of industry and company standards and manufacturer's instructions

Module Examinations

Performance Profile Sheets

MODULE 33210-05 – COMPUTER APPLICATIONS

- Overhead projector and screen
- Transparencies
- Blank acetate sheets
- Transparency pens
- Whiteboard/chalkboard
- Markers/chalk
- Pencils and scratch paper
- Appropriate personal protective equipment
- Sample integrated circuit chip
- Sample circuit boards
- Desktop personal computer
- Different types of mice
- Several different monitors
- Various types of data storage devices, including:
 - DVD-R
 - CD-RW
 - Floppy disks
 - USB Flash drives
 - Flash memory card
 - Magnetic tape cartridges
 - ZIP® disk
- Operating software in CD-ROM
- Laptop computer
- Pocket PC and tablet PC
- Samples of various types of twisted-pair, optical-fiber, and composite cable
- IEEE 802.7
- Cable stock
- DB9 and/or DB25 cable connectors with hoods
- Solder
- Soldering flux
- Soldering iron
- Communications software
- Shrink tubing
- Software on floppy disk or CD-ROMs
- Various types of networking cable
- Null modem cable
- Quick Quiz
- Module Examinations
- Performance Profile Sheets

MODULE 33211-05 – ADVANCED TEST EQUIPMENT

Overhead projector and screen

Transparencies

Blank acetate sheets

Transparency pens

Whiteboard/chalkboard

Markers/chalk

Pencils and scratch paper

Appropriate personal protective equipment

Various test equipment and operator's manuals, including:

- Oscilloscope

- Oscilloscope probes and tips

- Signal generator

- Wattmeter

- Megohmmeter

- Digital multimeter

- Frequency counter

- Power factor meter

- Chart recorder

- Lineman's test set

- Cable toner

- Cable certification testers

- Sound pressure level meter

- RF power meter

- RF frequency analyzer meter

- Impedance bridge

- Time-domain reflectometer

Quick Quiz

Module Examinations

Performance Profile Sheets

Level Three

MODULE 33301-04 – CABLE SELECTION

- Overhead projector and screen
- Transparencies
- Blank acetate sheets
- Transparency pens
- Whiteboard/chalkboard
- Markers/chalk
- Pencils and scratch paper
- Samples of different types of cable
- Copy of the latest edition of the *National Electrical Code*[®]
- Module Examinations
- Performance Profile Sheets

MODULE 33302-04 – BUSES AND NETWORKS

- Overhead projector and screen
- Transparencies
- Blank acetate sheets
- Transparency pens
- Whiteboard/chalkboard
- Markers/chalk
- Pencils and scratch paper
- Appropriate personal protective equipment
- Sample network cables and connectors
- X-10[™] and PLC computer work stations, printers, servers, hubs, cables, modems, and tools to connect same
- Module Examinations
- Performance Profile Sheets

MODULE 33303-04 – FIBER OPTICS

Overhead projector and screen
Transparencies
Blank acetate sheets
Transparency pens
Whiteboard/chalkboard
Markers/chalk
Pencils and scratch paper
Appropriate personal protective equipment
Laser light pen or other light source
Samples of optical fiber
Samples of various fiber-optic cables
Samples of various transmitters and receivers
Various samples of couplers
Manufacturer's installation procedures for fiber-optic cable
Samples of Chinese finger trap grip and duplex pulling grip
Splice closures/organizers
Distribution hardware
Patch panels
Junction boxes
Manufacturer's instructions and specific tools for selected connectors
Lapping tool
Ribbon cable array connectors
SMA connectors
Plastic-ferrule simplex connectors
DNP connectors
SC connectors
FDDI connectors
FC connectors
Universal SC/FC connectors
Various types of patch cords
Manufacturer's instructions and tools for splices
Rotary or polished-ferrule splices
V-groove splices
Elastomer splices
Four-rod splices
Sophisticated fusion splicer
Capillary splices
Four-rod connectors
Samples of cable enclosures
Optical power meters
Optical time-domain reflectometer
Module Examinations
Performance Profile Sheets

MODULE 33304-04 – VIDEO SYSTEMS

Overhead projector and screen

Transparencies

Blank acetate sheets

Transparency pens

Whiteboard/chalkboard

Markers/chalk

Pencils and scratch paper

Appropriate personal protective equipment

Manufacturer's video projection system operationg instructions

Video display and projection equipment (including scalers, line doublers, and video switchers) and tools, cables, and connectors for connecting same

HD-15 connectors, cables, and the tools for terminating connectors

Video testing equipment

Module Examinations

Performance Profile Sheets

MODULE 33305-04 – WIRELESS COMMUNICATION

Overhead projector and screen
Transparencies
Blank acetate sheets
Transparency pens
Whiteboard/chalkboard
Markers/chalk
Pencils and scratch paper
Appropriate personal protective equipment
Two-way radio
RF components: transmitter, receiver, antenna, and repeaters
Wireless microphone system
Wireless microphone system manufacturer's installation instructions
Cellular phone
IR LED/laser diodes
IR photo transistors and diodes
Dual IR emitter assembly
RF/IR coupler
RF/IR injector
Universal remote control unit and TV/VCR
IR remote audio system
Various types of IR receivers
RS-232 system components
IR listening device
Wireless LAN access point
Network interface card (NIC)
Wireless LAN antenna
RF field strength analyzer
RF analyzer/standing wave meter
RF power meter
Satellite tester
Oscilloscope
Spectrum analyzer
Frequency counter
CATV/DSS system components
X-10 system components: controllers, receivers, computer interface devices, RF repeater, noise filters and noise blocks, and signal bridge and blocking coupler
Power line carrier tester
Module Examinations
Performance Profile Sheets

MODULE 33306-04 – SITE SURVEY, PROJECT PLANNING, AND DOCUMENTATION

Overhead projector and screen
Transparencies
Blank acetate sheets
Transparency pens
Whiteboard/chalkboard
Markers/chalk
Pencils and scratch paper
Appropriate personal protective equipment
Complete set of construction drawings
Examples of as-built drawings
Examples of CSI formatted specifications
Copy of a typical scope of work
Examples of typical contract documents
Support equipment for site survey: ladders, flashlight, measuring device (wheel/50' tape/laser), handheld tape recorder, still or video camera, architect's rule
Examples of graphic-type and text-type project schedules
Examples of typical purchase orders
Examples of typical material safety data sheets
Personal computer with project scheduling software (optional)
Examples of tasks and labor estimates takeoff sheets/estimating forms
Graph paper for making schedules
Examples of materials estimates takeoff sheets/estimating forms
Addenda, liens, stop work orders, RFIs, change orders, project logs
Certificates of completion
Activation/deactivation reports, wiring certification diagrams and lists
Set of operation and maintenance (O&M) manuals
Module Examinations
Performance Profile Sheets

MODULE 33307-04 – MAINTENANCE AND REPAIR

Overhead projector and screen
Transparencies
Blank acetate sheets
Transparency pens
Whiteboard/chalkboard
Markers/chalk
Pencils and scratch paper
Appropriate personal protective equipment
ESD grounding wrist strap
ESD isolation containers
ESD ionizer
ESD-sensitive printed circuit boards
Test equipment, as applicable: multimeter (DMM/VOM), clamp-on ammeter, oscilloscope and probes, wire map tester, handheld cable tester, toner/wand
Telephone test set
Certification test set
Cable tracer
Optical light source and power meter
Time-domain reflectometer (TDR)
Optical time-domain reflectometer (OTDR)
Optical fiber flashlight
Low-intensity laser
Megohmmeter
Frequency meter/counter
Miscellaneous test adapters, leads, and cables
Examples of service manuals
Maintenance manuals for low-voltage systems and equipment
Manufacturers' troubleshooting aids
Computer
Computer networks: copper cable wired network and fiber-optic cable wired network
Examples of testing and inspection forms
Isopropyl alcohol and a clean, lint-free cloth
Module Examinations
Performance Profile Sheets

MODULE 33308-04 (MT101) – INTRODUCTORY SKILLS FOR THE CREW LEADER

Transparencies
Markers/chalk
Calculator
Pencils/scratch paper
Example of OSHA Log Books
Examples of MSDS Sheets
Copies of Module Examinations
Overhead projector Screen (or large blank wall)
Whiteboard/chalkboard

MODULE 33309-04 – RACK SYSTEMS

Overhead projector and screen
Transparencies
Whiteboard/chalkboard
Markers/chalk
Blank acetate sheets
Transparency pens
Pencils and scratch paper
Appropriate personal protective equipment
Rack layout drawing
Examples of rack accessories, including:

- Casters
- Mounting hardware
- Rack ears
- Rack support base

Examples of cable management devices
Equipment racks
Power strips
Ventilating fans
Blank panels
Rack-mount equipment
Module Examinations
Performance Profile Sheets

Level Four

MODULE 33401-03 – FIRE ALARM SYSTEMS

Overhead projector and screen

Transparencies

Blank acetate sheets

Transparency pens

Whiteboard/chalkboard

Markers/chalk

Pencils and scratch paper

Appropriate personal protective equipment

Copies of NFPA codes and standards

Different types of detectors (sensors)

- Heat detectors

- Smoke detectors

- Ionization detectors

- Photoelectric smoke detectors

- Flame detectors

- Carbon monoxide detectors

Initiating devices, wiring, and tools necessary to complete a four-wire initiating circuit

RJ31-X telephone jacks, wiring, and tools necessary to wire an RJX telephone jack

Copy of the latest edition of the *National Electrical Code*®

Copies of the latest edition of the *National Fire Alarm Code*

Fire alarm system, pull stations, and tools necessary to wire, program, commission, and troubleshoot a conventional zone fire alarm or simulator

Blank copies of the NFPA Record of Completion

Module Examinations

Performance Profile Sheets

MODULE 33402-03 – INTRUSION DETECTION SYSTEMS

Overhead projector and screen

Transparencies

Blank acetate sheets

Transparency pens

Whiteboard/chalkboard

Markers/chalk

Pencils and scratch paper

Appropriate personal protective equipment

Different types of security sensors

- Magnetic switch sensors

- Glass-break detectors

- Burglar alarm screens

- Shock (vibration) detectors

- Photoelectric detectors

- Seismic sensors

- Proximity sensors

Different types of glass

Different types of notification devices

- Bells

- Buzzers

- Horns

- Chimes

- Sirens

Different types of control panels

Copies of NFPA codes and standards

Copies of *UL Commercial Extent Number 1*

Copies of the *SIA Control Panel – False Alarm Reduction Features Standard*

Blank copies of the Intrusion System Standby Battery Calculation form

Sensors, notification devices, control panel, and tools necessary to install, program and test a security system or simulator

Copies of the latest edition of the *National Fire Alarm Code*

Copies of the latest edition of the *National Electrical Code*®

Module Examinations

Performance Profile Sheets

MODULE 33403-03 – AUDIO SYSTEMS

Overhead projector and screen
Transparencies
Whiteboard/chalkboard
Markers/chalk
Blank acetate sheets
Transparency pens
Pencils and scratch paper
Appropriate personal protective equipment
Sample polar plots for various real-world microphones
Sample frequency response diagrams from real-world speaker systems
Speaker cones
Microphones
Mixers
Distribution amplifiers
Compressors
Gates
Expanders
Transformers
Bulk microphone and speaker cabling
Real time analyzer
Spectrum analyzer
Tone generator
Sound pressure level meter
Oscilloscope
XLR connectors
RCA connectors
Phone jack connectors
Module Examinations
Performance Profile Sheets

MODULE 33404-03 – OVERVIEW OF NURSE CALL AND SIGNALING SYSTEMS

Overhead projector and screen
Transparencies
Whiteboard/chalkboard
Markers/chalk
Blank acetate sheets
Transparency pens
Pencils and scratch paper
Appropriate personal protective equipment
ANSI/UL1069, Hospital Signaling and Nurse Call Equipment
NFPA-70, National Electrical Code
NEMA Installation Guide for Nurse Call Systems
Installation and operation manual for a nurse call system
Nurse call signaling and annunciation components
Low-voltage hook-up wire
Module Examinations
Performance Profile Sheets

MODULE 33405-03 – CCTV SYSTEMS

Overhead projector and screen
Transparencies
Whiteboard/chalkboard
Markers/chalk
Blank acetate sheets
Transparency pens
Pencils and scratch paper
Appropriate personal protective equipment
A working digital CCTV system
Video cameras and lenses
Waveform monitor
Vectorscope
Color bar generator
Test cables
Module Examinations
Performance Profile Sheets

MODULE 33406-03 – BROADBAND SYSTEMS

Overhead projector and screen
Transparencies
Whiteboard/chalkboard
Markers/chalk
Blank acetate sheets
Transparency pens
Pencils and scratch paper
Appropriate personal protective equipment
Assortment of broadband equipment manufacturers' catalogs
Service manuals for various CATV/SMATV components
Copies of operational CATV/SMATV system as-built drawings and documentation
Copy of the latest edition of the *National Electrical Code*®
Radial crimp male F-connectors for RG-6 or RG-11 cable
Equal lengths of RG-6, RG-11, and RG-59 coaxial cable for demonstration of cable attenuation loss
Sample lengths of RG-6 and RG-11 coaxial cable
Sample lengths of semiflex coaxial cable
Access to one or more operational CATV/SMATV systems
Assortment (or photos) of head end components including:
 Television broadcast receiving antennas and preamps
 Broadband VHF and UHF preamplifiers
 Satellite receiving antennas and downconverters
 Strip amplifiers
 Single-channel converters
 Agile heterodyne processors
 Demodulators and modulators
 Satellite receivers
 Stereo encoders
 Combiners and splitters
 Filters
Assortment (or photos) of distribution system components including:
 Distribution amplifiers and line extenders
 Splitters
 Directional couplers and taps
 Attenuators and terminators
Multimeter
Signal generator
Signal level meter (SLM)
Spectrum analyzer
Cable tone test set
Satellite tester
Portable color TV receiver
Assorted test cables and related connectors and adapters
Cable cutter
Coaxial cable stripper
Coaxial cable crimping tool for the specific type of F-connector being used for practicing coaxial cable termination
Torque wrench (25 to 30 inch-pound range)
Module Examinations
Performance Profile Sheets

MODULE 33407-03 – ACCESS CONTROL SYSTEMS

- Overhead projector and screen
- Transparencies
- Blank acetate sheets
- Transparency pens
- Whiteboard/chalkboard
- Markers/chalk
- Pencils and scratch paper
- Appropriate personal protective equipment
- Coded credentials
 - Magnetic stripe cards
 - Proximity cards
 - Proximity key ring tags
 - Smart cards
- Electric strike locks and electric locksets
- Electric bolt locks
- Electromagnetic locks and push bars
- Touch sense bars and cables
- Exit switches and accessories
- Electric locking device, exit touch bar, controller, key pad, and tools necessary to install, program, and test an access control system
- Module Examinations
- Performance Profile Sheets

MODULE 33408-03 – SYSTEMS INTEGRATION

- Overhead projector and screen
- Transparencies
- Blank acetate sheets
- Transparency pens
- Whiteboard/chalkboard
- Markers/chalk
- Pencils and scratch paper
- Examples stored on a laptop or other computer, or screen captures printed out, of graphical interfaces for building systems (stored or printed samples not necessary if Internet access is available)
- Module Examinations

MODULE 33409-03 – SYSTEM COMMISSIONING AND USER TRAINING

- Overhead projector and screen
- Transparencies
- Whiteboard/chalkboard
- Markers/chalk
- Blank acetate sheets
- Transparency pens
- Pencils and scratch paper
- Appropriate personal protective equipment
- Module Examinations
- Performance Profile Sheets

MODULE 33410-03 – MEDIA MANAGEMENT SYSTEMS

Overhead projector and screen
Transparencies
Whiteboard/chalkboard
Markers/chalk
Blank acetate sheets
Transparency pens
Pencils and scratch paper
Appropriate personal protective equipment
Module Examinations

MODULE 33411-05 – TELECOMMUNICATIONS SYSTEMS

Overhead projector and screen
Transparencies
Blank acetate sheets
Transparency pens
Whiteboard/chalkboard
Markers/chalk
Pencils and scratch paper
Appropriate personal protective equipment
At the instructor's discretion, any items of telecommunications equipment suggested in the teaching tips
Module Examinations