

IEC Electrical Curriculum Objectives 2004-2005

- 101-1 Summarize policies and procedures of the IEC chapter sponsoring your training program.
- 101-2 List the advantages of being part of the Independent Electrical Contractors (IEC) apprenticeship program.
- 101-3 Describe the fundamental properties of electricity.
- 101-4 Discuss the law of electric charges and theories of current flow.
- 101-5 Describe components that go into blueprints.

- 102-1 Evaluate his/her reading and math skills level.
- 102-2 Identify standard hand tools used in the trade and demonstrate their proper use and care
- 102-3 Demonstrate the proper use of power tools.
- 102-4 Describe various types of prints and how to scale them
- 102-5 Describe hazardous situations and unsafe conditions
- 102-6 Use safe practices on the job

- 103-1 Recognize emergency situations.
- 103-2 Be prepared for emergencies.
- 103-3 Know the steps for taking action: Check, Call, and Care.
- 103-4 Know how to deal with conscious and unconscious victims.
- 103-5 Know how to clear an airway.
- 103-6 Know how and when to perform rescue breathing.
- 103-7 Know how and when to perform CPR.

- 104-1 Identify the causes, and how to reduce the risk of injury
- 104-2 Know about, and how to care for, cuts, scrapes and bruises.
- 104-3 Know about the types and causes, and how to care for, burns.
- 104-4 Know about, and how to care for, muscle, bone, and joint injuries.
- 104-5 Know how to recognize and care for sudden illness.
- 104-6 Know how to prevent poisoning; and/or treat it, if it occurs.
- 104-7 Know about heat and cold related illnesses and how they should be treated.
- 104-8 Know how to recognize and care for the special problems of the young and elderly.

- 105-1 Convert between English and metric systems.
- 105-2 Solve basic arithmetic problems
- 105-3 Solve problems involving fractions, decimals, ratios, and percentages
- 105-4 Perform calculations using scientific notation, roots, and powers
- 105-5 Apply proportions

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- 106-1 Identify commonly used electrical symbols and terms.
- 106-2 Identify appropriate boxes, outlets, switches, and luminaires.
- 106-3 Properly mount commonly used boxes, outlets, switches, and luminaires.
- 106-4 Determine the proper mounting height and position of receptacle outlets for various applications.
- 106-5 Properly install wall boxes in finished wall surfaces.
- 106-6 Make proper surface extensions for concealed wiring or boxes.
- 106-7 Properly size boxes and determine box fill according to NEC requirements.
- 106-8 Identify interchangeable wiring devices.
- 106-9 Solve math problems.

- 107-1 Determine branch circuit and conductor sizes for general lighting and receptacle loads.
- 107-2 Determine the ampacity of conductors.
- 107-3 Calculate total lighting load and number of branch circuits for a residence.
- 107-4 Determine the number of small appliance branch circuits that are required for a residence.
- 107-5 Determine where receptacle and lighting outlets must be installed in a residence.
- 107-6 Explain electric current, current flow, power and circuits.
- 107-7 Explain a simple electric circuit and its parts, including the functions of resistance, conductors, and insulators.
- 107-8 Calculate common AC voltage values.

- 108-1 Size wires for installation.
- 108-2 Define ampacity.
- 108-3 List various types of connectors and describe their use.
- 108-4 Explain what causes voltage drop in a circuit and how to calculate this voltage drop.
- 108-5 List different types of cables and describe their use.
- 108-6 Describe common types of conductors and conductor materials.

- 109-1 Explain the allowed uses of different colors of wire in a conduit or cable.
- 109-2 Identify the various types of toggle switches used in lighting circuits.
- 109-3 Describe the operation of the various types of toggle switches.
- 109-4 Demonstrate the correct wiring for each type of toggle switch.
- 109-5 Properly bond wiring devices in boxes.
- 109-6 Explain the causes and effects of inductive heating in circuits.
- 109-7 Describe common applications of Ohm's Law.
- 109-8 Explain the relationships among voltage current and resistance according to Ohm's Law.

- 110 Review

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- 111-1 Properly locate and install GFCI devices in a residence and on a construction site.
- 111-2 Explain why GFCIs are required.
- 111-3 Properly test, record results and identify GFCIs.
- 111-4 Relate the exceptions to the Code regarding location of GFCI devices.
- 111-5 Explain the basic principles and installation of transient voltage surge suppressors, immersion detection circuit interrupters, and appliance leakage circuit interrupters.
- 111-6 Calculate voltage, current, and resistance using Ohm's Law.

- 112-1 Connect luminaires (fixtures) in electrical circuits.
- 112-2 Explain the effects of temperature on luminaires (fixtures).
- 112-3 Explain thermal protection of luminaires (fixtures) and how it is accomplished.
- 112-4 Understand the cautions to be observed when installing outdoor lighting.
- 112-5 Using Ohm's law, determine the effects of all components of a series circuit.

- 113-1 Explain the factors that influence the grouping of outlets into circuits.
- 113-2 Draw a cable layout and wiring diagram for bedroom circuits, based on plans, specifications and code requirements.
- 113-3 Properly size, select, install, and ground wall boxes.
- 113-4 List the code requirements for installation of luminaires (fixtures) in closets and storage areas.
- 113-5 List the code requirements for the installation of paddle fans.
- 113-6 Estimate the probable load for a room or circuit based on number of lights and outlets.
- 113-7 Describe operations and functions in series circuits.

- 114-1 Develop a wiring diagram for hallways and bathrooms.
- 114-2 Hanging luminaires (fixtures) and outlets in bathrooms and hallways according to NEC.
- 114-3 Explain requirements for GFCI circuits in bathrooms, according to NEC.
- 114-4 Determine resistance using resistor color codes.
- 114-5 Use a meter to take basic measurements.

- 115-1 Define wet and damp locations.
- 115-2 Figure box fill calculations for gangable boxes.
- 115-3 Review math applications.

- 116-1 Identify various types of luminaires (fixtures) used in kitchens and describe how they are switched and powered.
- 116-2 Calculate how many watts or volt-amperes are drawn by the total lighting load.
- 116-3 Describe how the noise level of a fan used in the kitchen is rated.
- 116-4 Describe how and why a kitchen clock outlet is connected.
- 116-5 Describe what is unique about a small appliance circuit
- 116-6 Explain where GFCI receptacles are required in the kitchen.
- 116-7 Perform load calculations for small appliance circuits.
- 116-8 Distinguish between an outlet and a receptacle and how each is grounded.

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- 117 Review
- 118 Exam
- 119-1 Demonstrate the uses and installation of track lighting.
- 119-2 Demonstrate the uses and installation of dimmer controls for incandescent and fluorescent loads.
- 119-3 Demonstrate the uses and installation of valence lighting.
- 119-4 Review residential circuits.

- 120-1 Describe how clothes dryers function and list the proper connections for clothes dryers
- 120-2 Use the NEC to properly size the conductors and to properly connect the circuits required for clothes dryers
- 120-3 Use the NEC to determine the proper grounding of laundry room equipment
- 120-4 Install outlets required in a laundry room, according to NEC requirements
- 120-5 Relate the requirements for attic fans, lighting, and pilot light switches
- 120-6 Describe the operation of a parallel circuit

- 121-1 Properly install lighting in a residential garage
- 121-2 Explain the Code requirements for GFCI protection in a residential garage
- 121-3 Explain the Code requirements for underground wiring with both conduit and cable
- 121-4 Discuss typical outdoor lighting and Code requirements
- 121-5 Properly bring cables and conduit through foundation walls
- 121-6 Analyze and make proper connections for a residential garage door opener
- 121-7 Explain the reason for the Code requirements for overload protection with garage door openers
- 121-8 Calculate resistance, voltage, current and power in a parallel circuit

- 122-1 Identify and explain recreation room lighting and receptacles, including lay-in fixtures and receptacles for a wet bar
- 122-2 Explain losses in an electrical circuit in regard to watts loss and voltage drop
- 122-3 Define and use the concepts of balanced load and open neutral circuitry
- 122-4 Identify electrical circuits in a workshop area including lighting, multi-outlet strips and appliances in garages
- 122-5 Define and use GFCI requirements for the installation of electrical circuitry in basements
- 122-6 Identify and explain cable, conduit fill and outlet boxes fill for electrical circuitry in basements

- 123-1 Describe the requirements for well pump installations
- 123-2 Figure conductor size, conduit size, and over-current for the pump circuit
- 123-3 Describe the requirements for electric water-heater installations
- 123-4 Reconstruct the basic operation of the electric water heater
- 123-5 Explain the effects of the internal resistances of power sources

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- 124-1 Interpret all special receptacle symbols used for cooking appliances
- 124-2 Calculate circuits for all kitchen appliances
- 124-3 Size conductors for all kitchen appliances
- 124-4 Explain how each type of control is used to control the temperature on cooking appliances
- 124-5 Use the tap rules for kitchen appliances
- 124-6 Use the NEC, as it relates to kitchen appliances, including conductor sizing, grounding, circuit sizing and overcurrent protection.
- 124-7 Describe the operation of a series/parallel circuit
- 124-8 Calculate resistance, voltage, current and power in a series/parallel circuit

- 125-1 Explain the operation and switching of the heat/vent/light in the bathroom
- 125-2 Describe the operation of a humidistat and the installation of an attic fan with a humidistat
- 125-3 Discriminate among various methods of switching exhaust fans
- 125-4 Utilize the code requirements for installations of hydromassage bathtubs
- 125-5 Describe the operation of electric heating and its advantages for heating a residence
- 125-6 Describe thermostat control of electric heating
- 125-7 Utilize Code rules governing the installation of electric heating
- 125-8 Utilize the Code and installation requirements for air conditioners and heat pumps
- 125-9 Illustrate how heating and cooling may be connected to the same circuit

- 126-1 Explain the operation of gas and oil heaters
- 126-2 Install and operate the controls for gas and oil heaters
- 126-3 Identify self-generating systems
- 126-4 Design supply circuit wiring according to the NEC

- 127 Mid-Term Review

- 128-1 Describe television systems consisting of outlet boxes, antennas, cables, lead-in wires, and CATV
- 128-2 Utilize Code rules for the installation of regular television systems and CATV
- 128-3 Describe satellite antenna systems
- 128-4 Describe telephone wiring
- 128-5 Utilize Code rules for the installation of telephone wiring
- 128-6 Describe signal systems
- 128-7 Utilize Code rules for the installation of signaling systems

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- 129-1 Identify the various types of line voltage and low voltage lamps you may encounter
- 129-2 Identify the various types of fluorescent lamps you may encounter
- 129-3 Identify the various types of high intensity discharge lamps you may encounter
- 129-4 Define and use lamp terminology
- 129-5 Describe the importance of lamp temperature
- 129-6 Describe the importance of color rendition
- 129-7 Describe types of energy saving lamps

- 130-1 Describe how to install heat and smoke detection systems
- 130-2 Explain the various types of detectors and their use
- 130-3 Define the minimum levels of protection provided by various installations and mounting locations for heat and smoke detection systems
- 130-4 List the major features of a residential security system

- 131-1 Explain proper use of blocks in rigging of heavy loads
- 131-2 Explain proper use of rope in rigging heavy loads
- 131-3 Utilize the various types of knots used in the rigging of heavy loads
- 131-4 Identify the proper safety procedures to use when dealing with heavy loads

- 132-1 Define basic conduit bending terminology
- 132-2 Use formulas for bending conduit
- 132-3 Perform layout for conduit bending

- 133-1 Identify all components used on electrical service installations
- 133-2 Relate how NEC impacts service installations
- 133-3 Size electric service equipment
- 133-4 Determine grounding types and connections
- 133-5 Determine grounding sizes
- 133-6 Describe various fuse and breaker types
- 133-7 Determine fuse and breaker sizes
- 133-8 Explain short circuit current

- 134-1 Diagram proper wiring with regard for human safety for pools, spas, hot tubs, and hydromassage bathtubs
- 134-2 Describe and evaluate preventative measures associated with electric shock resulting from faulty wiring, and other hazards associated with pools, spas, hot tubs, and hydromassage bathtubs
- 134-3 Differentiate between permanently installed pools, and portable or stored pools in terms of the wiring and Code rules pertaining to each category
- 134-4 Describe, comprehend, and apply the basic Code rules for wiring of swimming pools, spas, hot tubs, and hydromassage bathtubs

- 135 Review

- 136 Final

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- 207-1 < Solve for all circuit values in series resistive – capacitive circuits.
- 207-2 < Solve for all circuit values in parallel resistive – capacitive circuits.

- 208-1 < Discuss series RLC circuits.
- 208-2 < Solve for all values in series RLC circuits.
- 208-3 < Describe resonance.
- 208-4 < Discuss parallel RLC circuits.
- 208-5 < Solve for all values in parallel RLC circuits.
- 208-6 < Calculate values for power factor correction.

209- Review

- 211-1 < Discuss the basic theory of single-phase transformers.
- 211-2 < Identify and explain the use of isolation transformers.
- 211-3 < Calculate transformer values.
- 211-4 < Identify and explain the use of autotransformers.
- 211-5 < Read and understand transformer schematics.
- 211-6 < Discuss voltage and current relationships in transformers.
- 211-7 < Discuss basic single-phase transformer field testing techniques.
- 211-8 < Read and interpret transformer nameplates.

- 212-1 < Discuss the operation of three phase transformers.
- 212-2 < Explain the characteristics of closed delta and open delta connections.
- 212-3 < Identify wye connections.

- 213-1 < Properly install transformers to provide safety for non-qualified personnel and to provide accessibility to qualified personnel only.
- 213-2 < Properly construct vaults.
- 213-3 < Safely work in confined spaces..

- 214-1 < Calculate single-phase transformer values.
- 214-2 < Calculate three-phase delta-connected transformer values.
- 214-3 < Calculate three-phase wye-connected transformer values.
- 214-4 < Calculate the size of secondary feeder taps according to the leads served.
- 214-5 < Identify transformer impedance and interrupting capacity.
- 214-6 < Properly protect transformer primaries and secondaries according to the NEC.

- 215-1 < Explain secondary ties and their uses.
- 215-2 < Understand and apply the NEC Code governing secondary ties.
- 215-3 < Develop transformer diagrams for additive/subtractive polarity.
- 215-4 < Develop transformer diagrams for single-phase transformers.
- 215-5 < Perform load calculations for three-phase delta-connected transformers.
- 215-6 < Perform load calculations for three-phase wye-connected transformers.
- 215-7 < Determine proper grounding and bonding for separately derived systems.

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- 216-1 < Explain the operating principle of analog meters.
- 216-2 < Explain the different analog meter types and their use.
- 216-3 < Discuss the use of clamp-on versus in-line ammeters
- 216-4 < Describe digital meters and their use.
- 216-5 < Explain the operation and use of the low-impedance voltage tester.
- 216-6 < Explain what an oscilloscope is and why it must often be used.
- 216-7 < Explain the use of wattmeters, recording meters and bridges.

- 217 Review

- 218 Exam

- 219-1 < Analyze how a DC generator is constructed and how it works.
- 219-2 < Explain the purpose of field windings.
- 219-3 < Identify the purpose of armature windings.
- 219-4 < Discuss series, shunt, and compound generators.
- 219-5 < Describe counter-torque, armature reaction, and the neutral plane.
- 220-1 < Explain how DC motors work.
- 220-2 < Explain counter EMF.
- 220-3 < Differentiate between shunt, series, and compound motors.
- 220-4 < Calculate values for horsepower and efficiency of DC motors.
- 220-5 < Explain how permanent magnet motors work and their strengths and weaknesses.

- 221-1 < Explain the principles of operation of three-phase alternators.
- 221-2 < Identify the components of a three-phase alternator.
- 221-3 < Discuss the factors that control alternator frequency.
- 221-4 < Discuss the factors that control output voltage.
- 221-5 < Describe how to parallel alternators.
- 221-6 < Apply NEC requirements related to alternator (generator) conductor sizing and conductor overcurrent protection.

- 222-1 < Describe the basic operating principles of three-phase motors.
- 222-2 < Differentiate the various types of three-phase motors.
- 222-3 < Calculate the synchronous speed of a three-phase motor.
- 222-4 < Calculate the efficiency of a three-phase motor.
- 222-5 < Analyze motor slip and motor torque.

- 223-1 < List the different types of single-phase motors.
- 223-2 < Explain the operating characteristics of each type of single-phase motor.
- 223-3 < Discuss the characteristics of the primary types of three-phase motors.

- 224-1 < Utilize the NEC to properly size motor branch circuits.
- 224-2 < Utilize the NEC to properly size motor feeder conductors.
- 224-3 < Analyze the proper sizing of running overload protection for motors.
- 224-4 < Use the NEC to properly size and install motor controllers.
- 224-5 < Use the NEC to properly size and install motor disconnects.

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- 225-1 < Review utilizing the NEC to properly select motor branch and feeder circuit conductors, motor overload and overcurrent protection, motor controllers and motor disconnects.
- 225-2 < Troubleshoot motor windings and components.

- 226-1 < Discuss the different types of motor control circuits and relevant NEC requirements.
- 226-2 < Explain motor starters and starter components.
- 226-3 < Explain the basic NEC requirements related to the use of compressor motors.

- 227 Review and Exam

- 228-1 < Summarize the purpose of the Code, how it is governed and how it can be changed.
- 228-2 < Define various terms commonly used in the NEC.
- 228-3 < Determine the circular mil area of a given size of wire.
- 228-4 < Calculate the correct conductor for a given ampacity, load, and wiring application.
- 228-5 < Determine the correct conduit size for a given group of wires.
- 228-6 < Determine the correct size of junction, device, or pull box for a given situation.
- 228-7 < Solve Code-related questions from NEC articles.

- 229-1 < Determine the proper locations of electrical outlets.
- 229-2 < Recommend the correct number of small appliance, laundry and general lighting circuits in a dwelling.
- 229-3 < Install outside aerial feeders and branch circuits with the proper clearance.
- 229-4 < Determine the proper size of flexible cord for a given application.
- 229-5 < Properly install lighting fixtures in clothes closets.
- 229-6 < Properly install recessed lighting fixtures.
- 229-7 < Recommend the proper size conductor for an electrical water heater.
- 229-8 < Recommend the proper size wiring for baseboard electrical heaters.
- 229-9 < Properly install wiring for a push-button and door chime.
- 229-10 < Solve Code-related questions from NEC Articles: 210, parts I and II; 220, part I; 225; 320; 396; 380; 402; 404; 406; 410; 422; 424; 426; 720; and 725.

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- 230-1 < Determine service entrance conductor sizing.
- 230-2 < Calculate demand loads for ranges in a dwelling.
- 230-3 < Determine the minimum ampere load for a residential building.
- 230-4 < Determine the minimum ampere load for a small commercial building
- 230-5 < Perform various service and optional calculations.
- 230-6 < Answer questions relating to NEC Articles 220, Parts II, III and IV; 230; and 600.

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- 231-1 < Properly install electrical equipment grounding, system grounding, and bonding.
- 231-2 < Specify when an electrical system is required to be grounded and which conductor must be grounded.
- 231-3 < Determine the proper sizing for equipment grounding conductors, grounding electrode conductors, and bonding conductors.
- 231-4 < Contrast the different types of overcurrent conditions and their possible damage to equipment.
- 231-5 < Discuss electrical faults and equipment interrupting ratings.
- 231-6 < Determine voltage drop on conductors and properly size conductors so as to limit voltage drop to acceptable levels.
- 231-7 < Answer Code-related questions from NEC Articles 240, 250, 280, 408, 490, 550, 551, 552, and 680.

- 232-1 < Employ motor circuit codes and calculations.
- 232-2 < Distinguish among different divisions and classes of hazardous locations.
- 232-3 < Explain the functions of explosion-proof enclosures.
- 232-4 < Perform the wiring methods permitted in Class 1 locations.
- 232-5 < Perform the wiring methods permitted in Class 2 locations.
- 232-6 < Perform the wiring methods permitted in Class 3 locations.
- 232-7 < Analyze Code-related questions from NEC Articles 430, 440, 455, 460, 470, 675, 685, 500, 501, 502, 503, 504, 510, 511, 513, 514, 515, 516.

- 233-1 < Explain the different Codes involved in health care facilities and those for Article 517, in particular.
- 233-2 < Explain the Codes involved in the installation of circuits to X-ray equipment.
- 233-3 < Specify the codes involved in the installation of therapeutic massage tubs and associated equipment.

- 233-4 < Explain the requirements for the installation of generators in electrical systems.
- 233-5 < Discuss the Codes involved with installing emergency and alternate power systems.
- 233-6 < Analyze Code-related questions from NEC Articles 517; 660; 680; 445; 480; 690; 692; 700; 701; 702; 705; 760.

- 234-1 < Decide the ampacities and uses for the various types of cables for commercial and industrial applications.
- 234-2 < Install cable tray. NEC Article 695
- 234-3 < Utilize codes dealing with dielectric heating, induction heating and heating pipelines and vessels.
- 234-4 < Install underfloor raceways.
- 234-5 < Explain the Code requirements for the installation of manufactured wiring systems.
- 234-6 < Explain the Code requirements for wiring to elevators, dumbwaiters, escalators, and moving walks.
- 234-7 < Analyze Code-related questions and review the requirements given in NEC Articles 322, 326, 368, 372, 374, 380, 384, 390, 392, 427, 518, 545, 600, 604, 610, 620, 630, 665, 668, 669, 670, 727, 770.

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- 235-1 < Design allowable wiring methods for theaters, motion picture and television studios, and stages.
 - 235-2 < Explain the Code requirements for agricultural and farm buildings.
 - 235-3 < Employ the Code requirements for wiring CATV and other communications systems.
 - 235-4 < Employ the Code requirements for marinas and boatyards.
 - 235-5 < Analyze Code-related questions from NEC Articles 520, 525, 530, 540, 547, 553, 555, 625, 640, 650, 780, 800, 810, 820, 830.
 - 235-6 < Review the Code book overall and determine problem areas.
- 236 Exam

IEC Electrical Curriculum Objectives 2004-2005

- 301-1 Summarize policies and procedures of the IEC chapter sponsoring your training program
- 301-2 Review the advantages of being part of the Independent Electrical Contractors (IEC) apprenticeship program
- 301-3 Use a Hazcom manual on the job
- 301-4 Maintain safe practices on the job and deal appropriately with unsafe conditions that may arise
- 301-5 Have a clear understanding of your math skills at this level

- 302-1 Check, call, and care
- 302-2 Control bleeding from different sites on the body
- 302-3 Care for a victim in shock
- 302-4 Care for a victim of heat, electrical or chemical burns
- 302-5 Care for eye injuries
- 302-6 Control nose bleeds
- 302-7 Care for a victim of fractures, dislocations, sprains and strains
- 302-8 Care for a victim of poisoning
- 302-9 Care for a victim of hypothermia or hyperthermia
- 302-10 Care for a victim of a diabetic emergency
- 302-11 Care for a victim of stroke or seizures
- 302-12 Describe the purpose of rescue breathing and how rescue breathing works
- 302-13 Explain when rescue breathing is needed
- 302-14 Perform rescue breathing
- 302-15 Distinguish between airway obstruction that requires first aid and those obstructions that can best be cleared by a victim's own efforts
- 302-16 Describe the first aid given to an unconscious and conscious victim who is choking
- 302-17 Describe the purpose of CPR
- 302-18 Describe and perform CPR on an adult
- 302-19 List four conditions when a rescuer may stop CPR

- 303-1 Discuss blueprint processes
- 303-2 Identify the various lines and symbols used on construction drawings
- 303-3 Identify the CSI format for construction drawing organization
- 303-4 Interpret the use of scales on construction drawings

- 304-1 Use a site plan to locate utility installation connections
- 304-2 Determine elevations of the various site improvements
- 304-3 Use the various site plans to determine the locations of site improvements such as roadways, curbs, gutters, sidewalks, and area lighting

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- 305-1 Detail information provided on Structural plans and be able to use that information on the construction site
- 305-2 Detail information provided on Architectural plans and be able to use that information on the construction site
- 305-3 Detail information provided on Mechanical plans and be able to use that information on the construction site

- 306-1 Use electrical floor plan blueprints for branch circuits
- 306-2 Use electrical floor plan blueprints to determine routings and requirements for feeders
- 306-3 Use electrical reflected ceiling plans for locating luminaires, lighting outlets, and lighting circuits

- 307-1 Read an electrical one-line diagram
- 307-2 Determine the proper size conduit and conductors for each service or feeder run shown on a one-line diagram
- 307-3 Determine the locations and requirements for electrical distribution rooms, lockers, or centers
- 307-4 To determine the location and size of transformers on the electrical distribution system

- 308-1 Interpret a riser diagram for a fire alarm system
- 308-2 Work with a control diagram for lighting systems
- 308-3 Apply the riser diagram for a telephone, television, data, or other communications systems
- 308-4 Recognize the various symbols on blueprints for special system components using the electrical symbols and abbreviations used on the blueprints

- 309 Exam

- 310-1 Identify different types of communication systems
- 310-2 Understand how to install different types of communication equipment and cables
- 310-3 Explain structured wiring systems
- 310-4 Install common telephone circuits and systems
- 310-5 Install video communication systems
- 310-6 Understand network cabling
- 310-7 Know how to test voice, data, and video wiring systems

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- 311-1 Describe fiber optics
- 311-2 Illustrate the basics of information transmission
- 311-3 Compare the advantages and disadvantages of fiber optics over other communications media
- 311-4 Describe safety techniques to be followed in working with optical fiber
- 311-5 Identify the correct procedure for fiber optic cable installation

- 312-1 Develop and explain three-phase motors and connections
- 312-2 Solve problems with three-phase delta systems
- 312-3 Solve problems with three-phase wye systems
- 312-4 Evaluate the operation of transformers
- 312-5 Determine the proper troubleshooting procedures for transformers
- 312-6 Discuss what harmonic currents are in an AC circuit
- 312-7 Determine the effects of harmonic currents in an AC circuit
- 312-8 Perform troubleshooting and correction procedures for harmonic circuits

- 313-1 Explain why and where grounding is required
- 313-2 Identify the theories applicable to grounding
- 313-3 Explain the reasons for electrical shock and safeguards used to prevent electrical shock
- 313-4 Identify electrical faults and shorts and various types of electrical grounding systems
- 313-5 Utilize a grounding electrode system

- 314-1 Identify the proper requirements for installation of the grounding electrode conductor
- 314-2 Select the proper system and circuit grounding
- 314-3 Analyze grounded conductors and their proper installation
- 314-4 Properly install equipment grounding conductors

- 315-1 Explain where and how to use bonding
- 315-2 Properly ground enclosures and equipment
- 315-3 Analyze when and where to use grounding conductors for equipment grounding
- 315-4 Analyze ground fault protection
- 315-5 Explain about grounding requirements on circuitry over 1000 volts

- 316-1 Utilize proper grounding and installation techniques for a separately derived system
- 316-2 Install the electrical and grounding system in multiple buildings supplied by one service
- 316-3 Analyze the result of fault currents

- 317 Review

- 318 Exam

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- 319-1 Explain electrical production and values
 - < Voltage
 - < Current
 - < Resistance
 - < Power
- 319-2 Calculate electrical quantities using Ohm's Law
- 319-3 Calculate current using the power formula
- 319-4 Calculate resistance, voltage, current and power using series circuit formulas
- 319-5 Calculate resistance, voltage, current, and power using parallel circuit formulas
- 319-6 Calculate resistance, voltage, current and power using series and parallel circuit formulas

- 320-1 Summarize basic tool and work safety
- 320-2 Demonstrate tool operation
- 320-3 Analyze basic motor control theory and line diagrams
- 320-4 Derive information from basic electrical symbols

- 321-1 Apply the basic rules of motor control
- 321-2 Analyze the three basic sections of a control circuit
- 321-3 Discriminate among the logic functions used in control work
- 321-4 Construct common types of control circuits

- 322-1 Apply the basic rules of motor control
- 322-2 Analyze the three basic sections of a control circuit
- 322-3 Discriminate among the logic functions used in control work
- 322-4 Construct common types of control circuits

- 323-1 To show the difference between a manual contactor and a manual starter
- 323-2 To demonstrate the difference between a line diagram and a wiring diagram
- 323-3 To discuss the importance of overload protection and overload operation
- 323-4 Choose the correct NEMA type enclosures
- 323-5 To show basic solenoid designs and types
- 323-6 To demonstrate proper solenoid application
- 323-7 To identify the causes of solenoid problems
- 323-8 Select and size NEMA and IEC starters

- 324-1 Analyze common control wiring, including two- and three-wire control
- 324-2 Discriminate between AC and DC contactors
- 324-3 Explain the reason for arc suppression in contactors
- 324-4 Select proper overload design
- 324-5 Specify contactor-related accessories
- 324-6 Perform basic troubleshooting

- 325-1 Operate common timers
- 325-2 Explain timer operation
- 325-3 Distinguish among the timing codes used in on and off delay electrical circuits

- 326-1 Wire circuits with manual contactors and manual starters
- 326-2 Wire circuits with overload protection
- 326-3 Wire circuits with basic solenoids
- 326-4 Wire circuits using common control wiring

IEC Electrical Curriculum Objectives 2004-2005

- 326-5 Wire circuits using AC and DC contactors
- 326-6 Wire circuits with the proper overload design
- 326-7 Wire on and off delay circuits

- 327-1 Explain the basic pushbutton parts, selector switches and their modifications
- 327-2 Utilize truth or target tables
- 327-3 Apply limit switches
- 327-4 Employ pressure, vacuum, liquid level and temperature switches

- 328 Review and Exam

- 329-1 Analyze how three-phase wye and three-phase delta motors differ
- 329-2 Explain proper reversal techniques for three-phase motors
- 329-3 Explain proper reversal techniques for single-phase motors
- 329-4 Explain proper reversal techniques for DC motors
- 329-5 Determine how to interlock reversing systems

- 330-1 Use pushbutton parts and selector switches on motor controls
- 330-2 Use limit switches on motor controls
- 330-3 Use pressure, vacuum, liquid levels and temperatures switches
- 330-4 Demonstrate reversal techniques for three-phase, single-phase and DC motors
- 330-5 Use wye and delta transformer bank connections
- 330-6 Use switchboards and panelboards
- 330-7 Use motor control centers and systems

- 331-1 Review the various definitions related to conventional fire alarms
- 331-2 Describe how basic fire prevention signaling systems work
- 331-3 Install the alarm initiating devices used in fire alarm systems
- 331-4 Install the alarm indicating appliances used in fire alarm systems

- 332-1 Demonstrate proper installation techniques for fire alarm systems
- 332-2 Demonstrate proper understanding of initiating devices
- 332-3 Demonstrate proper understanding of notification appliances

- 333-1 Determine the proper location for various fire alarm system components
- 333-2 Properly install fire alarm cabling and system components
- 333-3 Properly start up and test an installed fire alarm system
- 333-4 Develop proper maintenance procedures for fire alarm systems
- 333-5 Determine proper troubleshooting procedures for fire alarm systems
- 333-6 Access the various new technology systems that are currently in use

- 334-1 Demonstrate proper installation techniques for new technology fire alarm systems
- 334-2 Demonstrate proper start-up procedures for fire alarm systems
- 334-3 Demonstrate proper repair and troubleshooting procedures for a fire alarm system

- 335 Review

- 336 Exam

IEC Electrical Curriculum Objectives 2004-2005

- 401 Orientation and Safety
- 402 First Aid
- 403 First Aid
- 404-1 Utilize the basic printed circuit (PC) Board and its main components
- 404-2 Analyze semiconductor theory and its relation to semiconductor devices
- 404-3 Categorize N-type and P-type material
- 404-4 Classify rectification systems
- 404-5 Differentiate among various types of diodes
- 404-6 Explain the theory, operation, and use of various other solid state devices

- 405-1 Discuss the operations and functions of various electromechanical relays
- 405-2 Demonstrate proper contact arrangement and terminology
- 405-3 Describe the operation and functions of solid state relays
- 405-4 Demonstrate the selection and installation of the proper relay for an application
- 405-5 Identify the advantages and disadvantages of different types of relays

- 406-1 Utilize solid state control devices
- 406-2 Operate electromechanical and solids state relays

- 407-1 Evaluate when and how to use a photoelectric control in a control circuit
- 407-2 Explain how the different types of photoelectric controls function
- 407-3 Discriminate among the different types of proximity switches and how they function
- 407-4 Explain the Hall effect

- 408-1 Explain the uses of the programmable controller
- 408-2 Relate the functions of the parts of a programmable controller
- 408-3 Identify I/Os and write a simple program for a programmable controller
- 408-4 Categorize programmable controller applications
- 408-5 Identify the advantages of using multiplexing for specific applications

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- 409-1 Install and connect photoelectric and proximity controls
- 409-2 Hook up and use a programmable controller

- 410 Review/Exam

- 411-1 Determine the reasons for reduced voltage starting in AC and DC motors
- 411-2 Explain how a primary resistor starter works
- 411-3 Explain how an autotransformer starter works
- 411-4 Explain how a part-winding starter works
- 411-5 Explain how a wye-delta starter works
- 411-6 Explain how a solid state starter works

- 412-1 Distinguish among various motor braking techniques
- 412-2 Explain multispeed motors and their connections
- 412-3 Utilize various ways to control the speed of a motor

- 413-1 Practice using various reduced voltage starters
- 413-2 Employ the brakes and control the speed of various motors

- 414-1 Specify preventative maintenance techniques and programs
- 414-2 Demonstrate proper troubleshooting techniques
- 414-3 Evaluate why motors fail

- 415-1 Troubleshoot motor control system

- 416-1 Identify your personal leadership style
- 416-2 Develop meeting and brainstorming leadership skills
- 416-3 Develop skills in working cooperatively with others
- 416-4 Develop skills in active listening and observing and analyzing group processes

- 417 Review

- 418 Exam

- 419-1 Describe major power quality problems and sources
- 419-2 Discuss the basic concepts and procedures for power quality measurement
- 419-3 Discuss the effects of poor power quality on electrical equipment and systems
- 419-4 Discuss indicators of power quality problems and the equipment and methods used to resolve those problems

IEC Electrical Curriculum Objectives 2004-2005

- 420-1 Summarize the various codes and standards that will impact you as you pursue your trade as an electrician
- 420-2 Summarize the various types of injuries that can result from electrical shock and discuss the treatment for each
- 420-3 Identify and use appropriate electrical protective clothing
- 420-4 Describe the various types of voltage systems typically used in residential, commercial, and industrial applications
- 420-5 Interpret any Code requirements related to low voltage systems
- 420-6 Interpret any code requirements related to working clearances

- 421-1 Identify the major and minor ways in which electricity is produced and distributed
- 421-2 Connect wye and delta transformer bank connections
- 421-3 Describe the functions of a substation
- 421-4 Explain the difference between feeders, busways and other downstream systems
- 421-5 Discuss motor control centers and systems

- 422-1 Interpret Code requirements related to services
- 422-2 Interpret Code requirements related to switchboards and panelboards

- 423-1 Identify conductor types and their intended application
- 423-2 Determine the ampacity of conductors
- 423-3 Compute proper circuit loading
- 423-4 Match temperature markings
- 423-5 Interpret and apply NEC requirements for selecting and sizing conductors
- 423-6 Interpret and apply NEC requirements for derating conductors.
- 423-7 Interpret and apply NEC requirements for protection of equipment conductors, and tap conductors
- 423-8 Select and apply circuit breakers and fuses in accordance with NEC requirements
- 423-9 Interpret and apply NEC requirements for ground fault protection for equipment and personnel.

- 424-1 Explain why lightning protection for electrical systems is needed

- 424-2 List and explain the various types of devices and systems that are used to provide lightning protection
- 424-3 Interpret and apply NEC requirements for circuit and system grounding
- 424-4 Interpret and apply NEC requirements for equipment grounding
- 424-5 Interpret and apply NEC requirements for supply and load equipment bonding
- 424-6 Interpret and apply NEC requirements for grounding electrode systems

IEC Electrical Curriculum Objectives 2004-2005

- 425-1 Interpret and apply NEC requirements for sizing boxes, conduit and fittings based on required conductor and device fill
- 425-2 Interpret and apply NEC requirements for conductor fill for gutter, auxiliary gutters, panelboards, and cable tray
- 425-3 Interpret and apply NEC requirements for box support
- 425-4 Interpret and apply NEC requirements for AC, MC, NM, and SE cable
- 425-5 Interpret and apply NEC requirements for RMC, IMC, and EMT
- 425-6 Interpret and apply NEC requirements for flexible metal conduit and liquid tight flexible metal conduit
- 425-7 Interpret and apply NEC requirements for the installation of cable and raceway systems

- 426-1 Interpret and apply NEC requirements for residential branch circuits
- 426-2 Interpret and apply NEC requirements for commercial and industrial branch circuits
- 426-3 Interpret and apply NEC requirements for feeder circuits
- 426-4 Interpret and apply NEC requirements for AC, MC, NM, and SE cable
- 426-5 Interpret and apply NEC requirements for RMC, IMC, and EMT
- 426-6 Interpret and apply NEC requirements for flexible metal conduit and liquid tight flexible metal conduit
- 426-7 Interpret and apply NEC requirements for the installation of cable and raceway systems

- 428-1 Interpret and apply NEC requirements for residential receptacle outlets
- 428-2 Interpret and apply NEC requirements GFCI protection of residential receptacle outlets
- 428-3 Interpret and apply NEC requirements for GFCI protection of receptacles in and around boathouses, swimming pools, storage pools, spas, hot tubs, and hydromassage tubs
- 428-4 Interpret and apply NEC requirements for receptacles on construction sites
- 428-5 Interpret and apply NEC requirements for receptacles installed in commercial and industrial locations
- 428-6 Interpret and apply NEC requirements for residential luminary and switching outlets
- 428-7 Interpret and apply NEC requirements for commercial and industrial luminary and switching outlets
- 428-8 Interpret and apply NEC requirements for switching outlets by pools, hot tubs, and spas

IEC Electrical Curriculum Objectives 2004-2005

- 429-1 Describe the five types of electric motors
- 429-2 Interpret and apply NEC requirements for sizing motor branch and feeder circuit conductors
- 429-3 Interpret and apply NEC requirements for sizing motor branch circuit protective devices
- 429-4 Interpret and apply NEC requirements for sizing motor circuit overload and short circuit protective devices
- 429-5 Interpret and apply NEC requirements for motor disconnecting means
- 429-6 Interpret and apply NEC requirements for individual and group installations of hermetically sealed motor compressors

- 430-1 Describe the different types of hazardous locations
- 430-2 Discuss the Code requirements for Class I installations
- 430-3 Discuss the Code requirements for Class II installations
- 430-4 Discuss the Code requirements for Class III installations
- 430-5 Define intrinsically safe locations
- 430-6 Discuss how to use Code requirements governing intrinsically safe equipment

- 431-1 Describe the Code requirements for commercial garage installations
- 431-2 Describe the Code requirements for aircraft hanger installations
- 431-3 Describe the Code requirements for gasoline station installations
- 431-4 Describe the Code requirements for bulk storage plant installations
- 431-5 Describe the Code requirements for spray painting, dipping, and coating room installations

- 432-1 Interpret and apply NEC requirements for signs
- 432-2 Interpret and apply NEC requirements for field-installed skeleton tubing
- 432-3 Select and size sign circuits according to the NEC

- 433-1 Perform load calculations for single and multifamily residences.
- 433-2 Perform load calculations for commercial occupancies.
- 433-3 Perform load calculations for industrial facilities.

- 434-1 Interpret and apply NEC requirements
- 434-2 Interpret requirements of local codes pertaining to electrical work
- 434-3 Take and pass the state and/or local Journeyman's Exam
- 435 Review

- 436 Exam