

Electrical
Level II Unit Outline

Unit 1: Agenda Book Review/Classroom Rules

- Class discussion of student agenda book
- Review of classroom rules
- School safety protocols, district drills and emergency evacuations, behavior and meeting locations
- Review expectations and school policies for electronic devices

Unit 2: Safety, First Aid, Personal Protective Equipment and Shop Attire

- Identify, discuss, locate first aid and bloodborne kits
- Identify, locate and demonstrate function and purpose of the Emergency Eye Station
- Identify, discuss, locate fire extinguisher
- Identify, distribute and discuss function and uses of protective eyewear, appropriate personal protective equipment (PPE) required in shop, and acceptable shop attire
- Identify, show location and discuss function and uses of the SDS (Safety Data Sheets) and how to interpret the information about paints and aerosols, content precautions, material labeling
- Equipment safety protocols
- Identify, demonstrate shop ventilation systems where applicable
- Identify locate and discuss function of shop flammable cabinet where applicable
- Discuss and demonstrate shop housekeeping of supplies, work stations and room maintenance
- Discuss and identify electrical safety considerations in the shop area
- Compile a safety section in the student shop notebook
- Identify, demonstrate air gauge function and operation where applicable
- Completion of online safety course and successful passing of safety test(s)

Unit #3: Electrical Careers for the Trade

- Review job descriptions, definitions, and responsibilities of apprentice, journeyman, and master electrical workers
- Analyze earning power of skilled electricians
- Evaluate employment opportunities in the electrical trade
- Learn trade-related terms and definitions
- Discuss licensing requirements for electrical contractors in the State of New Jersey

Unit #4: Basic Electricity and Electronics Theory I

- Review and reinforce terms and definitions used in the electrical trades
- Review and expand on the understanding of atomic structure, electron flow, and amp capacity
- Review and discuss sources of EMF
- Explore the use of conductors and insulators
- Learn or review schematic symbols and how and where to use them
- Discuss the relationship of volts, amps, and resistances
- Discuss Ohms Law and its practical uses in the trade

Unit #5: Tools and Equipment II

- Learn use of wire and cable termination tools – mechanical and hydraulic
- Learn use of wire and cable splice devices
- Learn how to use insulating wraps and heat shrink materials
- Use of mechanical and hydraulic knockout cutters
- Use of electric and hydraulic power actuated tools
- Use of conduit cutting, bending and threading equipment & tools
- Use of cable and wiring pulling tools and equipment
- Explore the use of support hardware

Unit #6: Using the National Electrical Code

- Explore the purpose of the NEC
- Explore the history of the NEC
- Learn how to reference the NEC
- Discuss calculating loads
- Discuss selecting conductors
- Discuss installation of required circuits
- Learn use of tables in NEC
- Determine service calculations as per NEC

Unit #7: Residential Electrical Systems

- Design and calculate for general lighting, small appliance and dedicated circuits
- Learn Service Entrance Calculations
- Learn the installation of RX and AC cables
- Learn the installation process of EMT conduit
- Explore the cutting and threading of rigid conduit
- Learn to install main and sub panels using 100 and 200 amp

- Ability to read residential floor plans

Unit #8: Three Phase Service Installations

- Explore three phase delta and open delta configurations
- Explore three phase Wye configurations
- Discuss the Delta to Wye transformation
- Understanding of transformer theory and interconnections
- Learn about voltage testing and identification of High Leg
- Learn the principles of transformer grounding methods
- Understanding of NEC requirements for transformers
- Express importance of safety in proper voltage testing for three phase systems with or without a grounded conductor

Unit #9: Blue Print Reading

- Use of vocabulary and definitions related to reading blue prints
- Knowledge of structural symbols used in blue prints
- Use of other trade related symbols
- Knowledge of electrical symbols
- Discuss and explore print specifications, notes and legends
- Explore electrical layout as per NEC

Unit #10: Load Calculations

- Discuss minimum load requirements as per NEC
- Discuss commercial lighting requirements and voltages
- Principles of motor conductor and over current protection calculations
- Principles of heating and AC load calculations
- Discuss aspects of demand factors
- Discuss aspects of voltage drop
- Discuss aspects of line carrier devices and control devices
- Explore surge and Tvss devices
- Explore different detection systems – line and low voltage
- Explore site lighting

Unit #11: Service Calculations

- Use of vocabulary and definitions related to service calculations
- Discuss load calculations per NEC

- Discuss total load determination
- Use of distribution equipment
- Principles of switch gear and disconnect loads
- Principles of sub panel loads
- Principles of balancing loads
- Principles of G.F.C.I. over current protection
- Explore effective grounding path methods
- Discuss sizing grounding electrode conductors

Unit #12: Commercial Lighting

- Explore types of lighting
- Explore selection of luminaires
- Learn different voltages for commercial lighting
- Identify methods of switching lighting loads
- Identify methods of supporting luminaires per NEC
- Learn NEC requirement for fixture whips
- Discuss safety related to installing and servicing lighting fixtures
- Discuss principles of grounded conductor sizing per NEC

Unit #13: Commercial Wiring Methods

- Discuss vocabulary and definitions related to commercial wiring
- Distinguish between wiring methods permitted and not permitted
- Learn aspects of XC type cables
- Learn custom cable assemblies
- Explore aspects and principles relating to conduit, conduit bodies, and fittings
- Learn principles of conduit related hardware and its installation
- Learn requirements of conduit as per NEC
- Learn how to bend and thread conduit

Unit #14: Low Voltage Switching Relays

- Discuss vocabulary and definitions related to switching and relays in the electrical trades field
- Identify low voltage coils and diodes
- Identify momentary contact switching
- Explore 12+24 voltage power relays
- Explore low voltage relays and thermostat uses
- Identify safety and limit relays used in the electrical field

Unit #15: Furnace and Boiler Controls

- Discuss vocabulary and definitions related to furnace and boiler controls
- Discuss low voltage and low voltage controls
- Identify photoelectric safety cells
- Explore use of high and low limit controls
- Discuss zone values – line and low voltage
- Learn aspects relating to programmable thermostats
- Explore aquastats
- Identify safety related to high transformer voltage and flammable fuels

Unit #16: Ladder Diagrams

- Explore vocabulary and definitions related to diagrams
- Identify wiring diagram symbols
- Learn characteristics of ladder diagrams
- Learn characteristics of one line drawing
- Learn how to construct a ladder diagram

Unit #17: Motors and Controllers

- Discuss vocabulary and definitions related to motor and controllers
- Explore and discuss DC and AC motor theory
- Identify operating voltages of commercial and industrial motors
- Explore single phase motors
- Explore three phase motors
- Discuss motor controllers
- Explore principles related to stop-start stations

Electrical
New Jersey Student Learning Standards (NJSL)

NJ Learning Standards: CTE.9.3

CONTENT AREA:	STANDARD 9.3 CAREER AND TECHNICAL EDUCATION
ARCHITECTURE & CONSTRUCTION CAREER CLUSTER®	
Number	Standard statement
<i>By the end of Grade 12, Career and Technical Education Program completers will be able to:</i>	
CAREER CLUSTER®:	ARCHITECTURE & CONSTRUCTION (AC)
9.3.12.AC.1	Use vocabulary, symbols and formulas common to architecture and construction.
9.3.12.AC.2	Use architecture and construction skills to create and manage a project.
9.3.12.AC.3	Comply with regulations and applicable codes to establish and manage a legal and safe workplace.
9.3.12.AC.4	Evaluate the nature and scope of the Architecture & Construction Career Cluster and the role of architecture and construction in society and the economy.
9.3.12.AC.5	Describe the roles, responsibilities, and relationships found in the architecture and construction trades and professions, including labor/management relationships.
9.3.12.AC.6	Read, interpret and use technical drawings, documents and specifications to plan a project.
9.3.12.AC.7	Describe career opportunities and means to achieve those opportunities in each of the Architecture & Construction Career Pathways.
PATHWAY:	CONSTRUCTION (AC-CST)
9.3.12.AC-CST.1	Describe contractual relationships between all parties involved in the building process.
9.3.12.AC-CST.2	Describe the approval procedures required for successful completion of a construction project.
9.3.12.AC-CST.3	Implement testing and inspection procedures to ensure successful completion of a construction project.
9.3.12.AC-CST.4	Apply scheduling practices to ensure the successful completion of a construction project.
9.3.12.AC-CST.5	Apply practices and procedures required to maintain jobsite safety.
9.3.12.AC-CST.6	Manage relationships with internal and external parties to successfully complete construction projects.
9.3.12.AC-CST.7	Compare and contrast the building systems and components required for a construction project.
9.3.12.AC-CST.8	Demonstrate the construction crafts required for each phase of a construction project.
9.3.12.AC-CST.9	Safely use and maintain appropriate tools, machinery, equipment and resources to accomplish construction project goals.