

Syracuse City School District
Career and Technical Education Program
Course Syllabus
ELT100: Electrical Trades 100



Program Overview

The Electrical Trades Program is a four-year pathway designed to teach students the fundamentals of electricity theory, wiring methods and materials, national and local electrical codes, and print layout, the use of tools and electrical test equipment, the basics of electrical wiring and electrical construction according to the National Electric Code, OSHA 10 Construction Safety certification, and career ready workplace skills. Successful students will have the necessary experience to install receptacles, switches, lighting, and service entrance conductors and work with motors, generators and meters. In the classroom, students will learn both basic electrical theory and get practical hands-on experience, including completing a work-based internship in a local business. Throughout the program students will work both individually and as part of a team to complete assignments and projects. Safety will be given the highest priority at all times as students are working in the classroom. Upon successful completion of the Electrical Trades Program students will be able to obtain entry-level jobs in residential and commercial wiring. Students will also be prepared to continue training and education through post-secondary electrical technology programs at the college level or through private or electrical union apprenticeship programs.

Course Description

Electrical Trades 100 is an introductory course designed to give students a general overview of the Electrical Industry. This class is a pre-requisite for Electrical Trades 200, 300 and 400. The course includes an introduction to career opportunities, basic workplace safety, and an introduction to the tools and materials in the electrical trades.

Pre-Requisites

N/A

Course Objectives

1. Students will know the different types of jobs available in the electrical field.
2. Students will know the importance and seriousness of safety when working with electricity.
3. Students will have a foundational knowledge of electrical hand and power tools and their uses.
4. Students will have a foundational knowledge of electrical materials and their purposes.

Integrated Academics

N/A

Equipment and Supplies

- **School will provide:** Complete set of electrical hand tools, power tools, and personal protective equipment.
- **Student will provide:** work boots or safety shoes

Textbook

Henke-Konopasek, Nancy and Harvey N. Holzman. *Modern Residential Wiring, 10th Edition*. Tinley Park, IL: Goodhear-Wilcox Company, Inc., 2015. (Workbook)

Holzman, Harvey N. *Modern Residential Wiring, 10th Edition*. Tinley Park, IL: Goodheart-Willcox Co., Inc., 2015. (Textbook)

Grading

20%	Quizzes/Projects
10%	Homework
50%	Weekly Participation
20%	Tests

Additional Course Policies

Student attendance is very important due to the mandatory hours required for the national assessment. The absentee policy is strictly enforced.

Course Calendar

Quarter	Units of Study
1	<ul style="list-style-type: none">• Electrical Orientation• Electrical Safety
2	<ul style="list-style-type: none">• Electrical Mathematical Fundamentals
3	<ul style="list-style-type: none">• Power Tools and Safety
4	<ul style="list-style-type: none">• Hand Tools and Safety• Electrical Materials: Identification and Uses• Final Examination

Syracuse City School District
Career and Technical Education Program
Scope and Sequence
ELT100: Electrical Trades 100



Time Frame Unit of Study	Key Questions	Key Learning Targets (Students will know and be able to)	Assessment Evidence of Learning	CCTC Standards	NYS Standards
Weeks 1-12 Electrical Orientation Electrical Safety	<ul style="list-style-type: none"> • What are the expectations of the Electrical Trades program? • What are some of the career paths within the electrical industry? • Why is safety important in the electrical industry? • What do I need to know to keep myself and others safe in the shop? • What Personal Protective Equipment (PPE) is used by electricians? • What should be done to treat electrical shock? • What organizations create the rules and regulations for the electrical industry? 	<ul style="list-style-type: none"> • Discuss program expectations • Research the career pathways in the electrical industry. • List rules for general classroom and shop safety. • Explain and follow basic classroom safety rules and procedures. • Identify and demonstrate proper use of required PPE • Explain a lockout/tagout/blockout program. • Understand the effects of electrical shock. • Describe conditions likely to affect severity of electrical shock. • Describe steps for helping a shock victim. • Explain OSHA safety requirements for working in the electrical industry. • Explain the importance of the rules, regulations, and criteria for the installation of electrical equipment of National Electrical Code. 	Written <ul style="list-style-type: none"> • Daily, Weekly and Quarterly Assignments • Research Project on Five Sources of Energy • Quizzes • Written Exam on OSHA Safety Regulations (Must be passed before student can start the next unit.) • Portfolio Design and Set-Up • Self-Assessment Performance <ul style="list-style-type: none"> • Safety Checklist • Procedure Checklist • Teacher Observation Checklist • Practical Exam on PPE 	Career Ready Practices CRP 1,2,3,4 Cluster Standards AC 1,3 Pathway Standards AC-CST 5,9 AC-DES 2,4 AC-MO 1,6	ELA 9-10R 9-10W 9-10SL 9-10L Literacy 9-10RST 1,3,4,7 9-10WHST 2,4,7 Math
Weeks 13-20 Electrical Mathematical Fundamentals	<ul style="list-style-type: none"> • How is mathematics used in the electrical industry? • What algebraic equations are needed to complete electrical tasks? 	<ul style="list-style-type: none"> • Identify the practical applications of math in the electrical industry. • Demonstrate problem-solving techniques involving whole numbers, fractions, and decimals, using addition, subtraction, multiplication, and division. • Demonstrate techniques for converting fractions to decimals and decimals to fractions. • Calculate percentage and convert fractions to percentages. • Calculate circle area and circumference and rectangle area and perimeter. • Explain and apply formulas used regularly in the electrical industry including Ohm's law and the basic power formula. 	Written <ul style="list-style-type: none"> • Assignment on Ohm's Law, Watt's Law, Mathematical Formulas and Electrical Mathematical Formulas • Quizzes and Tests • Written Exam on Mathematical Fundamentals (Given pre and post to check students' math levels.) • Portfolio Update • Self-Assessment Performance <ul style="list-style-type: none"> • Safety Checklist • Procedure Checklist • Teacher Observation Checklist 	Career Ready Practice CRP 2,4,8 Cluster Standards AC 1 Pathway Standards AC-CST 5,8,9 AC-DES 8 AC-MO 3	ELA 9-10R 9-10W 9-10SL 9-10L Literacy 9-10RST 1,3,4,7 9-10WHST 2,4,7 Math 5.NBT.B.7 4.NFC.5 4.NFC.6 5.NFA.1 5.NFA.2 5.NFB.3 5.NFB.4 5.NFB.6 5.NFB.7 6.RPA.3C 7.RPA.3 7.G.B.4

Time Frame Unit of Study	Key Questions	Key Learning Targets (Students will know and be able to)	Assessment Evidence of Learning	CCTC Standards	NYS Standards
Weeks 21-30 Power Tools and Safety	<ul style="list-style-type: none"> What power tools are used in the electrical trades? Where is information on the safe use of power tools found? What are the basic safety procedures for using power tools? Why is it important to use the correct tool for the application? What should be done with damaged or broken power tools? 	<ul style="list-style-type: none"> Identify various power tools and their uses for cutting and drilling. Identify where to find safety information for power tools. Select essential power tools for residential wiring. Use electrical power tools safely and efficiently. Explain procedures for damaged or broken tools. 	Written <ul style="list-style-type: none"> Assignment on Quality of Tools Quizzes and Tests Written Exam on Power Tools and Safety Procedures Portfolio Update Self-Assessment Performance <ul style="list-style-type: none"> Safety Checklist Procedure Checklist Teacher Observation Checklist Practical Exam on Power Tools and Safety Procedures (Both written and practical assessments must be passed before student can go into work stations.) 	Career Ready Practice CRP 1,2,3,4,8 Cluster Standards AC 1,2,3 Pathway Standards AC-CST 5,7,8,9 AC-DES 8 AC-MO 1,2,3	6.G.A.1 6.EE.A.2.C A.CED.A.4 ELA 9-10R 9-10W 9-10SL 9-10L Literacy 9-10RST 1,3,4,7 9-10WHST 2,4 Math
Weeks 31-35 Hand Tools and Safety	<ul style="list-style-type: none"> What hand tools are used in the electrical trades? What is the most important thing to look for when purchasing electrical hand tools? What are the basic safety procedures for using hand tools? 	<ul style="list-style-type: none"> Identify basic electrical hand tools and their uses for measuring and working with wire and conduit. Identify considerations of quality and function when purchasing electrical hand tools. Select essential hand tools for residential wiring. Use hand tools safely and efficiently. 	Written <ul style="list-style-type: none"> Assignment on Quality of Tools Quizzes and Tests Written Exam on Hand Tools and Safety Procedures Portfolio Update Self-Assessment Performance <ul style="list-style-type: none"> Safety Checklist Procedure Checklist Teacher Observation Checklist Practical Exam on Hand Tools and Safety Procedures (Both written and practical assessments must be passed before student can go into work stations.) 	Career Ready Practice CRP 1,2,3,8 Cluster Standards AC 1,2,3 Pathway Standards AC-CST 5,7,8,9 AC-DES 8 AC-MO 1,2,3	ELA 9-10R 9-10W 9-10SL 9-10L Literacy 9-10RST 1,3,4,7 9-10WHST 2,4,7 Math
Weeks 35-39 Electrical Materials:	<ul style="list-style-type: none"> What types of materials are used in residential and commercial wiring? 	<ul style="list-style-type: none"> Identify the types of materials used in residential and commercial wiring. Describe the differences between 	Written <ul style="list-style-type: none"> Assignments Quizzes 	Career Ready Practice CRP 1,2,8	ELA 9-10R 9-10W 9-10SL

Time Frame Unit of Study	Key Questions	Key Learning Targets (Students will know and be able to)	Assessment Evidence of Learning	CCTC Standards	NYS Standards
Identification and Uses	<ul style="list-style-type: none"> • What is the National Electrical Code (NEC)? 	<ul style="list-style-type: none"> residential and commercial electrical materials. • List the different conductor systems used in residential and light commercial wiring. • Identify different types of raceway systems. • Describe the different materials used for conductors. • Describe the four types of boxes and box mounting systems. • Describe connectors that fasten wiring to boxes. • List and describe electrical circuit overcurrent protective devices (OCPDs). • Install materials in accordance with the NEC. 	<ul style="list-style-type: none"> • Written Exam on Uses of Electrical Materials • Portfolio Update • Self-Assessment Performance <ul style="list-style-type: none"> • Safety Checklist • Procedure Checklist • Teacher Observation Checklist • Practical Exam on Identification and Differentiation of Commercial and Residential Materials • Visual Exam on Materials Identification 		9-10L
				Cluster Standards AC 1,2,3	Literacy 9-10RST 1,3,4,7 9-10WHST 2,4,7
				Pathway Standards AC-CST 5,7,8,9 AC-DES 4,8 AC-MO 3,4,5	Math
Week 40 Final Examination	<ul style="list-style-type: none"> • What knowledge and skills are needed to pass the final exam? 	<ul style="list-style-type: none"> • Review for written final • Practice for hands-on assessment of core electrical tasks on safety and construction 	Written <ul style="list-style-type: none"> • Cumulative Final Exam • Portfolio Update • Self-Assessment Performance <ul style="list-style-type: none"> • Safety Checklist • Procedure Checklist • Teacher Observation Checklist • Cumulative Practical Assessment 	Career Ready Practice CRP 1,2,4,8	ELA 9-10R 9-10W 9-10SL 9-10L
				Cluster Standards AC 1,2,3,6	Literacy 9-10RST 1,3,4,7 9-10WHST 2,4,7
				Pathway Standards AC-CST 3,4,5,7,8,9 AC-DES 2,4,8 AC-MO 1,2,3,4,5	Math

Syracuse City School District
Career and Technical Education Program
Course Syllabus
ELT 200: Electrical Trades 200



Program Overview

The Electrical Trades Program is a four-year pathway designed to teach students the fundamentals of electricity theory, wiring methods and materials, national and local electrical codes, and print layout, the use of tools and electrical test equipment, the basics of electrical wiring and electrical construction according to the National Electric Code, OSHA 10 Construction Safety certification, and career ready workplace skills. Successful students will have the necessary experience to install receptacles, switches, lighting, and service entrance conductors and work with motors, generators and meters. In the classroom, students will learn both basic electrical theory and get practical hands-on experience, including completing a work-based internship in a local business. Throughout the program students will work both individually and as part of a team to complete assignments and projects. Safety will be given the highest priority at all times as students are working in the classroom. Upon successful completion of the Electrical Trades Program students will be able to obtain entry-level jobs in residential and commercial wiring. Students will also be prepared to continue training and education through post-secondary electrical technology programs at the college level or through private or electrical union apprenticeship programs.

Course Description

Electrical Trades 200 builds on skills learned in Electrical Trades 100 and gives students a more in-depth understanding of the knowledge and skills required to be successful in the electrical industry. This class is a pre-requisite for Electrical Trades 300. Students will build their knowledge and skills in wiring methods and materials, national and local electrical codes, and the proper tools for residential wiring. The course also includes job seeking and communication skills, and an introduction to important professional organizations. Throughout the course there is an emphasis on workplace safety.

Pre-Requisites

ELT 100: Electrical Trades 100

Course Objectives

1. Students will understand the job seeking and communication skills needed to enter the electrical field.
2. Students will understand the importance of workplace safety when working with electricity.
3. Students will learn the safe and efficient use of hand and power tools used in the electrical industry.
4. Students will have knowledge of electrical materials and their purposes for residential wiring.
5. Students will understand electrical theory and mathematics and be able to read electrical prints and schematics.

Integrated Academics

N/A

Equipment and Supplies

- **School will provide:** Complete set of electrical hand tools, power tools, and personal protective equipment.
- **Student will provide:** Work boots or safety shoes

Textbook

Holzman, Harvey N. *Modern Residential Wiring, 11th Edition*. Tinley Park, IL: Goodheart-Willcox Company, Inc., 2018.

Grading

20%	Quizzes/Projects
10%	Homework
50%	Weekly Participation
20%	Tests

Additional Course Policies

Student attendance is very important due to the mandatory hours required for licensing, so the absentee policy is strictly enforced.

Course Calendar

Quarter	Units of Study
1	<ul style="list-style-type: none">• Electrical Fundamentals:<ul style="list-style-type: none">○ Shop Safety○ Power and Specialized Tools○ Career and Communication Skills○ Professional Organizations• Electrical Energy Fundamentals
2	<ul style="list-style-type: none">• Understanding Basic Blueprints• Installation of Switch and Receptacle Boxes• Residential Electrical Installation:<ul style="list-style-type: none">○ Wiring Systems○ Raceways
3	<ul style="list-style-type: none">• Residential Electrical Installation:<ul style="list-style-type: none">○ Conductors○ Box Installation○ Fastening Devices○ Device Wiring
4	<ul style="list-style-type: none">• Residential Electrical Service and Distribution Theory• Residential Electrical Installation:<ul style="list-style-type: none">○ Service Entrance○ Load Centers○ Transformers○ Overcurrent Protection○ Grounding• Review and Final Examination

Syracuse City School District
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Scope and Sequence
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Time Frame Unit of Study	Key Questions	Key Learning Targets (Students will know and be able to)	Assessment Evidence of Learning	CCTC Standards	NYS Standards
Weeks 1-4 Electrical Fundamentals: <ul style="list-style-type: none"> • Shop Safety • OSHA 10 Construction Course Instruction • Power and Specialized Tools • Career and Communication Skills • Professional Organizations 	<ul style="list-style-type: none"> • Why is safety important in the electrical industry? • What power tools are used in the electrical trades? • What skills are needed to obtain a job in the electrical industry? • What professional organizations set standards for the electrical industry? 	<ul style="list-style-type: none"> • List basic shop safety rules. • Maintain safety practices and procedures during electrical installations. • Describe principles of safe tool use and maintenance. • Describe tools used for both essential and more specialized electrical installations including tools for making electrical measurements. • Explain the skills need to both obtain and retain jobs in the electrical industry. • Explore job titles related to electrical careers. • Describe training and licensing requirements for electricians. • Identify professional organizations in the electrical industry. 	Written <ul style="list-style-type: none"> • Assignments • Mock Interview Project • Research Project on Five Sources of Energy • Quizzes and Tests • OSHA 10 Formative Assessments • Portfolio Update • Self-Assessment Performance <ul style="list-style-type: none"> • Safety Checklist • Procedure Checklist • Teacher Observation Checklist 	Career Ready Practices CRP 1,2,3,4,8,10	ELA 9-10R 9-10W 9-10SL 9-10L
				Cluster Standards AC 1,3,4,5,7	Literacy 9-10RST 1,3,4,7 9-10WHST 2,4,9
				Pathway Standards AC-CST 5,9 AC-DES 2,4 AC-MO 1,2,3,4	Math
Weeks 5-10 Electrical Energy Fundamentals	<ul style="list-style-type: none"> • How is electricity measured? • What is the difference between direct and alternating current? • What algebraic equations are needed to complete electrical tasks? • What is Ohm's Law? • What is Watt's Law? • What is a series circuit? • What is a parallel circuit? 	<ul style="list-style-type: none"> • Explain the electron theory for current. • Define and explain the difference between direct current and alternating current. • Define basic electrical terms for measuring electricity including ampere, volt, ohm, watt, joule and kilowatt-hour. • Apply mathematical formulas used regularly in the electrical industry including Ohm's Law and Watt's Law (basic power formula). • Describe the makeup of series and parallel electrical circuits. 	Written <ul style="list-style-type: none"> • Assignments • Quizzes and Tests on Specific Areas of Electrical Theory • Portfolio Update • Self-Assessment Performance <ul style="list-style-type: none"> • Safety Checklist • Procedure Checklist • Teacher Observation Checklist • Practical Assessment on Electro-Motive Force (EMF) 	Career Ready Practice CRP 2,4,8	ELA 9-10R 9-10W 9-10SL 9-10L
				Cluster Standards AC 1	Literacy 9-10RST 1,3,4,7 9-10WHST 2,4,9
				Pathway Standards AC-CST 5,8,9 AC-DES 8 AC-MO 1	Math 6.EE.A.2.C A.CED.4
Weeks 11-16 Print Reading and Specifications Installation of Switch and Receptacle Boxes	<ul style="list-style-type: none"> • What do prints represent? • What components of prints are the most important? • When using electrical prints what is the importance of the scale and legend? • What is the proper procedure for installing switch and receptacle boxes? 	<ul style="list-style-type: none"> • Identify the types of prints that an electrician may read. • List the standard parts of drawings and prints. • Interpret a set of prints accurately • Identify and use standard electrical symbols. • Describe the schedules that are found on prints. • Describe the two types of notes. 	Written <ul style="list-style-type: none"> • Daily Assignments • Research Project On • Quiz and Tests • Exam on Print Specifications and Codes • Portfolio Update • Self-Assessment Performance <ul style="list-style-type: none"> • Safety Checklist 	Career Ready Practice CRP 1,2,4,8	ELA 9-10R 9-10W 9-10SL 9-10L
				Cluster Standards AC 1,2,3,6	Literacy 9-10RST 1,3,4,7 9-10WHST 2,4,7
				Pathway Standards AC-CST 5,7,8,9 AC-DES 4,7,8	Math

Time Frame Unit of Study	Key Questions	Key Learning Targets (Students will know and be able to)	Assessment Evidence of Learning	CCTC Standards	NYS Standards
		<ul style="list-style-type: none"> • Read an electrical print. • Identify specifications and explain their importance. • Explain where to find codes and authorities for an installation. • Explain the proper procedure for installing switch and receptacle boxes. • Use a print to correctly install a switch and receptacle. 	<ul style="list-style-type: none"> • Procedure Checklist • Teacher Observation Checklist • Practical Exam on Print Reading 	AC-MO 1,3	
Weeks 17-23 Residential Electrical Installation: <ul style="list-style-type: none"> • Wiring Systems • Raceways • Conductors 	<ul style="list-style-type: none"> • What is the National Electric Code (NEC)? • What are the components of a wiring system? • What kinds of cables are used in residential wiring? • What the basic ways of bending conduit? • What different materials are used for conductors? • How is the correct conductor size determined? 	<ul style="list-style-type: none"> • Explain where to find appropriate codes and authorities for electrical installation including the NEC. • Describe the different wiring systems and cables used in residential wiring. • Choose appropriate cable products for various installations. • Prepare standard types of cable for connection to device. • Describe different types of raceway materials. • Explain the distinct uses of different types of raceways, based on the NEC. • Cut, prepare, and join various types of raceway materials. • Demonstrate the basics of conduit bending. • List the NEC rules regarding conductors for general wiring. • Describe the different materials used for conductors. • Use the NEC to select a wire type when given a specific installation. • Determine the correct conductor size based on the circuit load using the NEC. • Properly specify wire size using the American Wire Gage (AWG) or kcmils. • Explain the cause of voltage drop. • Compute voltage drop. • List the factors that affect conductor ampacity rating. • Use the NEC to adjust conductor ampacity based on ambient temperature and number of conductors. • Prepare conductors for connection and make safe conductor splices. • Demonstrate the proper method for attaching conductors to devices and fixtures. 	Written <ul style="list-style-type: none"> • Daily Assignments • Quizzes and Tests • Written Exam on Raceways, Conductors, And Residential and Commercial NEC Codes • Portfolio Update • Self-Assessment Performance <ul style="list-style-type: none"> • Safety Checklist • Procedure Checklist • Teacher Observation Checklist 	Career Ready Practice CRP 1,2,3,4,8 Cluster Standards AC 1,2,3 Pathway Standards AC-CST 5,7,8,9 AC-DES 4,8 AC-MO 1,3	ELA 9-10R 9-10W 9-10SL 9-10L Literacy 9-10RST 1,3,4,7 9-10WHST 2,4,9 Math
Weeks 24-30	<ul style="list-style-type: none"> • What types of boxes are used 	<ul style="list-style-type: none"> • Identify the four common box shapes. 	Written	Career Ready Practice	ELA

Time Frame Unit of Study	Key Questions	Key Learning Targets (Students will know and be able to)	Assessment Evidence of Learning	CCTC Standards	NYS Standards
Residential Electrical Installation: <ul style="list-style-type: none"> • Box Installation • Fastening Devices • Device Wiring 	<p>in residential wiring?</p> <ul style="list-style-type: none"> • What are knockouts and pryouts? • What are the different types of fasteners used for box installation and device wiring? • How are conductors prepared, sliced and attached to devices and fixtures? 	<ul style="list-style-type: none"> • List four common box types and explain their uses. • Describe how to use knockouts and pryouts and how to gang boxes. • Demonstrate how to use different types of fasteners in box installation including clamps, ground clips, connectors, bushings, locknuts, couplings and holding devices. • Discuss box mounting systems and box fittings. • Explain and calculate box fill allotment. • Discuss covers for different boxes and applications. • Discuss the significance of listing or labeling electrical devices and materials. • Properly prepare conductors for connection to devices and equipment. • Make safe, secure conductor splices. • Demonstrate the proper method for attaching conductors to switches and receptacles. • Ground a receptacle. • Split-wire a receptacle. 	<ul style="list-style-type: none"> • Daily Assignments • Quizzes • Written Exam on Reading of Simple Electrical Diagrams • Portfolio Update • Self-Assessment <p>Performance</p> <ul style="list-style-type: none"> • Safety Checklist • Procedure Checklist • Teacher Observation Checklist • Practical Exam on Proper Sizing and NEC Requirements 	<p>CRP 1,2,4,8</p> <hr/> <p>Cluster Standards AC 1,2,3,6</p> <hr/> <p>Pathway Standards AC-CST 5,7,8,9 AC-DES 4,8 AC-MO 1,3</p>	<p>9-10R 9-10W 9-10SL 9-10L</p> <hr/> <p>Literacy 9-10RST 1,3,4,7 9-10WHST 2,4,9</p> <hr/> <p>Math 3.OA.D.8 3.OA.D.9</p>
<p>Weeks 31-35</p> <p>Residential Electrical Service and Distribution Theory</p> <p>Residential Electrical Installation:</p> <ul style="list-style-type: none"> • Service Entrance • Load Centers • Transformers 	<ul style="list-style-type: none"> • What is the importance of Ohm's and Watt's Laws? • How do Ohm's and Watt's Laws relate to NEC tables? • What are the components of an electrical circuit? • What is the service entrance? • What are the guidelines when locating the service entrance? • What is the function of the load center? • What is the function of a transformer? 	<ul style="list-style-type: none"> • Explain the formulas in Ohm's and Watt's Laws, how and when to apply them and their relationship to NEC tables. • Perform calculations on an electrical circuit using Ohm's and Watt's Laws. • Break down an electrical circuit into its components. • List the components of the service entrance. • Describe the guidelines for locating the service entrance. • Calculate the size of service entrance needed based on the power needs of the dwelling. • Calculate branch-circuit loads. • Determine the number of branch circuits for a house. • Explain the function of the load center. • Explain noncoincident loads. • Calculate feeder and service loads using two different methods. • Understand the basic requirements for switches, receptacles, and lighting. 	<p>Written</p> <ul style="list-style-type: none"> • Assignments • Research Project on Theory of Service Distribution • Test on Load Distribution • Portfolio Update • Self-Assessment <p>Performance</p> <ul style="list-style-type: none"> • Safety Checklist • Procedure Checklist • Teacher Observation Checklist • Practical Exam on Installation of 120v/240v Electrical Service According to Load Calculation and Syracuse City and NEC Codes (Students will be graded on competency and efficiency of installation.) 	<p>Career Ready Practice CRP 1,2,4,8</p> <hr/> <p>Cluster Standards AC 1,2,3</p> <hr/> <p>Pathway Standards AC-CST 5,7,8,9 AC-DES 4,8 AC-MO 1,3</p>	<p>ELA 9-10R 9-10W 9-10SL 9-10L</p> <hr/> <p>Literacy 9-10RST 1,3,4,7 9-10WHST 2,4,9</p> <hr/> <p>Math 3.OA.D.8 3.OA.D.9 A.CED.A.4 A.SSE.A.1.A</p>

Time Frame Unit of Study	Key Questions	Key Learning Targets (Students will know and be able to)	Assessment Evidence of Learning	CCTC Standards	NYS Standards
		<ul style="list-style-type: none"> • Demonstrate proper installation of service entrance components including conductors between the meter socket, main disconnect, and load center. • Explain the purpose of transformer and where it is used. • Compare and contrast step-up and step-down transformers. 			
Weeks 36-39 Residential Electrical Installation: <ul style="list-style-type: none"> • Overcurrent Protection • Grounding 	<ul style="list-style-type: none"> • What causes overcurrent in electrical circuits? • What are electrical current overcurrent protective devices (OCPDs)? • What are two types of grounding for electrical systems? • What is bonding? • What are two types of circuit interrupters? 	<ul style="list-style-type: none"> • Explain the causes of overcurrent. • List and describe electrical circuit OCPDs. • Describe the rating system for OCPDs. • Explain the operation of a ground-fault circuit interrupter (GFCI) and where it is used. • Explain how an arc-fault circuit interrupter (AFCI) works and the hazards it is designed to prevent. • Explain which branch circuits require an AFCI. • Explain the working principles for electrical grounding. • Describe system grounding and equipment grounding and their purposes. • Define bonding and explain how it is done. 	Written <ul style="list-style-type: none"> • Daily Assignments • Quizzes and Tests • Portfolio Update • Self-Assessment Performance <ul style="list-style-type: none"> • Safety Checklist • Procedure Checklist • Teacher Observation Checklist • Practical Exam on Identification of Different OCPDS and Their Uses • Practical Exam on Scenarios with Different Types of Grounding, Bonding, Fusing, and Sizing 	Career Ready Practice CRP 1,2,4,8 Cluster Standards AC 1,2,3 Pathway Standards AC-CST 5,7,8,9 AC-DES 4,8 AC-MO 1,3	ELA 9-10R 9-10W 9-10SL 9-10L Literacy 9-10RST 1,3,4,7 9-10WHST 2,4,9 Math
Week 39-40 Review and Final Examination	<ul style="list-style-type: none"> • What knowledge and skills are needed to pass the final exam? 	<ul style="list-style-type: none"> • Review for written final. • Practice for hands-on assessment of core electrical tasks on installation and design. 	Written <ul style="list-style-type: none"> • Cumulative Final Exam • Portfolio Update • Self-Assessment Performance <ul style="list-style-type: none"> • Safety Checklist • Procedure Checklist • Teacher Observation Checklist • Cumulative Practical Assessment of Skills 	Career Ready Practice CRP 1,2,4,8,11 Cluster Standards AC 1,2,3,6 Pathway Standards AC-CST 3,4,5,7,8,9 AC-DES 2,4,7,8 AC-MO 1,2,3,4	ELA 9-10R 9-10W 9-10SL 9-10L Literacy 9-10RST 1,3,4,7 9-10WHST 2,4,9 Math

Syracuse City School District
Career and Technical Education Program
Course Syllabus
ELT 300: Electrical Trades 300



Program Overview

The Electrical Trades Program is a four-year pathway designed to teach students the fundamentals of electricity theory, wiring methods and materials, national and local electrical codes, and print layout, the use of tools and electrical test equipment, the basics of electrical wiring and electrical construction according to the National Electric Code, OSHA 10 Construction Safety certification, and career ready workplace skills. Successful students will have the necessary experience to install receptacles, switches, lighting, and service entrance conductors and work with motors, generators and meters. In the classroom, students will learn both basic electrical theory and get practical hands-on experience, including completing a work-based internship in a local business. Throughout the program students will work both individually and as part of a team to complete assignments and projects. Safety will be given the highest priority at all times as students are working in the classroom. Upon successful completion of the Electrical Trades Program students will be able to obtain entry-level jobs in residential and commercial wiring. Students will also be prepared to continue training and education through post-secondary electrical technology programs at the college level or through private or electrical union apprenticeship programs.

Course Description

At this level, students will go into depth with the fundamentals of basic wiring established in ELT 200, including knowledge of the NEC for proper wiring, devicing, materials, and installation. Students will understand the what, how, and why of residential wiring as well as the proper procedure for making a residential wiring project efficient. Students will continue to build their understanding of Ohm's Law, Watt's Law and the NEC Code Book. They will know and apply the terminology and symbols on electrical prints as well as the proper tools and equipment needed for different installation tasks. Students who successfully complete ELT 300 will have the skills comparable to those required for an entry-level job in residential wiring.

Pre-Requisites

ELT 100: Electrical Trades 100
ELT 200: Electrical Trades 200

Course Objectives

1. Students will know the safety standards for OSHA 10 Construction Safety.
2. Students will know electrical theory and fundamentals.
3. Students will know the difference between residential and commercial wiring.
4. Students will understand electrical metering devices.
5. Students will know the proper identification and safe use of electrical hand and power tools.

Integrated Academics

1 CTE Integrated Math Credit

Equipment and Supplies

- **School will provide:** Complete set of electrical hand tools, power tools, and personal protective equipment.
- **Student will provide:** work boots or safety shoes

Textbook

Holzman, H. N. (2018). *Modern Residential Wiring, 11th Edition*. Tinley Park, IL: Goodheart-Willcox Company, Inc.

Grading

20%	Quizzes/Projects
10%	Homework
25%	Weekly Participation
25%	Labs
20%	Tests and Unit Exams

Additional Course Policies

Student attendance is very important due to the mandatory hours required for the national assessment. The absentee policy is strictly enforced.

Course Calendar

Quarter	Units of Study
1	<ul style="list-style-type: none">• Electrical Fundamentals:<ul style="list-style-type: none">○ Shop Safety○ Power and Specialized Tools○ Career and Communication Skills○ Professional Organizations• Electrical Energy and Mathematics Fundamentals
2	<ul style="list-style-type: none">• Print Reading, Specifications and Codes• Residential Electrical Installation:<ul style="list-style-type: none">○ Service Entrance○ Load Centers○ Transformers• Residential Electrical Installation: Conductors and Cables
3	<ul style="list-style-type: none">• Residential Electrical Installation:<ul style="list-style-type: none">○ Raceways Systems, Boxes Fittings and Covers,○ Device Wiring○ Lighting Systems○ Appliance Wiring and Special Outlets
4	<ul style="list-style-type: none">• Residential Electrical Installation:<ul style="list-style-type: none">○ Overcurrent Protection○ Grounding• Residential Electrical Service Design and Installation• Review and Final Examination

Syracuse City School District
Career and Technical Education Program
Scope and Sequence
ELT 300: Electrical Trades 300



Time Frame Unit of Study	Key Questions	Key Learning Targets (Students will know and be able to)	Assessment Evidence of Learning	CCTC Standards	NYS Standards
Weeks 1-3 Electrical Fundamentals: <ul style="list-style-type: none"> • Shop Safety • OSHA 10 Construction Course Instruction • Power and Specialized Tools • Career and Communication Skills • Professional Organizations 	<ul style="list-style-type: none"> • Why is safety important in the electrical industry? • What algebraic equations are needed to complete electrical tasks? • What power tools are used in the electrical trades? • What skills are needed to obtain a job in the electrical industry? • What professional organizations set standards for the electrical industry? 	<ul style="list-style-type: none"> • List basic shop safety rules. • Maintain safety practices and procedures during electrical installations. • Describe principles of safe tool use and maintenance. • Describe tools used for both essential and more specialized electrical installations including tools for making electrical measurements. • Explain the skills need to both obtain and retain jobs in the electrical industry. • Identify professional organizations in the electrical industry. 	Written <ul style="list-style-type: none"> • Assignments • Research Project on the Five Sources of Energy • Quizzes on Tools • OSHA 10 Formative Assessments • Portfolio Update • Self-Assessment Performance <ul style="list-style-type: none"> • Safety Checklist • Procedure Checklist • Teacher Observation Checklist • Practical Tool Identification Test 	Career Ready Practices CRP 1,2,3,4,8,10 Cluster Standards AC 1,3,4,5,7 Pathway Standards AC-CST 5,9 AC-DES 8 AC-MO 1,3	ELA 11-12R 11-12W 11-12SL 11-12L Literacy 11-12RST 1,2,4,9 11-12WHST 2,5,6,7 Math
Weeks 4-10 Electrical Energy and Mathematics Fundamentals	<ul style="list-style-type: none"> • How is electricity measured? • What is Ohm's Law? • What is Watt's Law? • What is the difference between direct and alternating current? • What is a series circuit? • What is a parallel circuit? 	<ul style="list-style-type: none"> • Define basic electrical terms for measuring electricity including ampere, volt, ohm, watt, joule and kilowatt-hour. • Apply mathematical formulas used regularly in the electrical industry including Ohm's Law and Watt's Law (basic power formula). • Explain the difference between direct current and alternating current. • Describe the makeup of series and parallel electrical circuits. 	Written <ul style="list-style-type: none"> • Assignments • Quizzes and test on specific areas of electrical theory • Portfolio Update • Self-Assessment Performance <ul style="list-style-type: none"> • Safety Checklist • Procedure Checklist • Teacher Observation Checklist 	Career Ready Practice CRP 2,4,8 Cluster Standards AC 1 Pathway Standards AC-CST 5,8,9 AC-DES 8 AC-MO 1	ELA 11-12R 11-12W 11-12SL 11-12L Literacy 11-12RST 1,2,4,7 11-12WHST 2,6,7 Math A.CED.A.4 6.EE.A.2.C N.Q.A.1 N.Q.A.2 N.Q.A.3
Weeks 11-16 Print Reading, Specifications and Codes Residential Electrical Installation: <ul style="list-style-type: none"> • Service Entrance • Load Centers • Transformers 	<ul style="list-style-type: none"> • What do prints represent? • What components of prints are the most important? • When using electrical prints what is the importance of the scale and legend? • What is the service entrance? • What are the guidelines when locating the service entrance? • What is the function of the load center? • What is the function of a transformer? 	<ul style="list-style-type: none"> • Identify the types of prints that an electrician may read. • List the standard parts of a drawing. • Identify and use standard electrical symbols. • Describe the schedules that are found on prints. • Describe the two types of notes. • Read an electrical print. • Identify specifications and explain their importance. • Explain where to find codes and authorities for an installation. 	Written <ul style="list-style-type: none"> • Assignments • Quiz and Tests • Written exams on proper sizing, efficiency, material handling, and timing • Portfolio Update • Self-Assessment Performance <ul style="list-style-type: none"> • Safety Checklist • Procedure Checklist • Teacher Observation Checklist 	Career Ready Practice CRP 1,2,4,8 Cluster Standards AC 1,2,3 Pathway Standards AC-CST 5,7,8,9 AC-DES 2,7,8 AC-MO 1,3,6	ELA 11-12R 11-12W 11-12SL 11-12L Literacy 11-12RST 1,2,4,7 11-12WHST 2,6,7 Math

Time Frame Unit of Study	Key Questions	Key Learning Targets (Students will know and be able to)	Assessment Evidence of Learning	CCTC Standards	NYS Standards
		<ul style="list-style-type: none"> Identify the marks of the most commonly used testing agencies. List the components of the service entrance. Describe the guidelines for locating the service entrance. Calculate the size of service entrance needed based on the power needs of the dwelling. Explain the function of the load center. Demonstrate proper installation of service entrance components including conductors between the meter socket, main disconnect, and load center. Explain the purpose of transformer and where it is used. Compare and contrast step-up and step-down transformers. 	<ul style="list-style-type: none"> Practical Assessment on Print Reading Practical Assessment of Proper Sizing, Efficiency, Material Handling, And Timing 		
Weeks 17-20 Residential Electrical Installation: Conductors and Cables Participation in Regional Skills USA Competition	<ul style="list-style-type: none"> What is the National Electric Code (NEC)? What different materials are used for conductors? How is the correct conductor size determined? What are the components of a wiring system? What kinds of cables are used in residential wiring? 	<ul style="list-style-type: none"> List the NEC rules regarding conductors for general wiring. Describe the different materials used for conductors. Use the NEC to select a wire type when given a specific installation. Properly specify wire size using the American Wire Gage (AWG) or kcmils. Explain the cause of voltage drop. Compute voltage drop. List the factors that affect conductor ampacity rating. Determine the correct conductor size based on the circuit load using the NEC. Use the NEC to adjust conductor ampacity based on ambient temperature and number of conductors. Demonstrate the proper method for attaching conductors to devices and fixtures. Describe the different wiring systems and cables used in residential wiring. Choose appropriate cable products for various installations. Prepare standard types of cable for connection to device. 	Written <ul style="list-style-type: none"> Assignments Quizzes and Tests Written Assessment on Identifying Proper Conductors According Ampacity Portfolio Update Self-Assessment Performance <ul style="list-style-type: none"> Safety Checklist Procedure Checklist Teacher Observation Checklist Practical Assessment on Conductor Sizing According to Given Ampacity Skills USA Competition 	Career Ready Practices CRP 1,2,4,6,8,12 Cluster Standards AC 1,2,3,6 Pathway Standards AC-CST 5,8,9 AC-DES 4,8 AC-MO 1,3	ELA 11-12R 11-12W 11-12SL 11-12L Literacy 11-12RST 1,2,4,7 11-12WHST 2,6,7 Math N.Q.A.1 N.Q.A.2 N.Q.A.3
Weeks 21-24 Residential Electrical Installation:	<ul style="list-style-type: none"> What the basic ways of bending conduit? What types of boxes are used in residential wiring? 	<ul style="list-style-type: none"> Describe different types of raceway materials. Explain the distinct uses of different types of raceways, based on the NEC. 	Written <ul style="list-style-type: none"> Assignments Research Project on Materials 	Career Ready Practices CRP 1,2,4,8,7,12	ELA 11-12R 11-12W 11-12SL 11-12L

Time Frame Unit of Study	Key Questions	Key Learning Targets (Students will know and be able to)	Assessment Evidence of Learning	CCTC Standards	NYS Standards
Raceways Systems, Boxes Fittings and Covers,	<ul style="list-style-type: none"> • What are knockouts and pryouts? • What are the different types of fasteners used for box installation and device wiring? 	<ul style="list-style-type: none"> • Cut, prepare, and join various types of raceway materials. • Demonstrate the basics of conduit bending. • Identify the four common box shapes. • List four common box types and explain their uses. • Describe how to use knockouts and pryouts and how to gang boxes. • Demonstrate how to use different types of fasteners in box installation including clamps, ground clips, connectors, bushings, locknuts, couplings and holding devices. • Discuss box mounting systems and box fittings. • Explain and calculate box fill allotment. • Discuss covers for different boxes and applications. 	<ul style="list-style-type: none"> • Quiz and Tests • Portfolio Update • Self-Assessment Performance <ul style="list-style-type: none"> • Safety Checklist • Procedure Checklist • Teacher Observation Checklist • Practical Assessment on Identification and Installation of Materials 	Cluster Standards AC 1,2,3,6 Pathway Standards AC-CST 5,8,9 AC-DES 4,8 AC-MO 1,3	Literacy 11-12RST 1,2,4,9 11-12WHST 2,5,6,7 Math 7.EE.B.3
Weeks 25-27 Residential Electrical Installation: Device Wiring Lighting Systems	<ul style="list-style-type: none"> • How are conductors prepared, sliced and attached to devices and fixtures? • What are the main types of lighting in a home? • Why are different types of lighting fixtures and lighting technologies used in a residential installation? 	<ul style="list-style-type: none"> • Discuss the significance of listing or labeling electrical devices and materials. • Properly prepare conductors for connection to devices and equipment. • Make safe, secure conductor splices. • Demonstrate the proper method for attaching conductors to switches and receptacles. • Ground a receptacle. • Split-wire a receptacle. • Define basic lighting terminology. • Explain the main types of lighting in a home. • Identify various lighting fixtures. • Select lighting fixtures for specific applications. • Compare lamp types and lighting technologies. • Identify various light switches • Make wiring connections for common lighting circuits 	Written <ul style="list-style-type: none"> • Assignments • Quiz and Tests • Written Assessment with Visual Aids on Identification of Devices • Portfolio Update • Self-Assessment Performance <ul style="list-style-type: none"> • Safety Checklist • Procedure Checklist • Teacher Observation Checklist • Practical Assessment on Proper Installation of Residential devices and lighting systems 	Career Ready Practices CRP 1,2,4,8,12 Cluster Standards AC 1,2,3,6 Pathway Standards AC-CST 5,8,9 AC-DES 8 AC-MO 1,3	ELA 11-12R 11-12W 11-12SL 11-12L Literacy 11-12RST 1,2,4,7 11-12WHST 2,6,7 Math
Weeks 28-30 Residential Electrical Installation: Appliance Wiring and Special Outlets	<ul style="list-style-type: none"> • What are the main concerns when installing appliances? • What are the electrical requirements of common household appliances? • What NEC regulations pertain to appliance circuits and other 	<ul style="list-style-type: none"> • Describe NEC regulations for appliance circuits and other special circuits. • Describe installation practices for various appliances and special circuits. • Describe various methods of heating. • Explain basic electrical requirements of many common household appliances. 	Written <ul style="list-style-type: none"> • Assignments • Quizzes • Portfolio Update • Self-Assessment Performance <ul style="list-style-type: none"> • Safety Checklist 	Career Ready Practices CRP 1,2,4,8,12 Cluster Standards AC 1,2,3,6	ELA 11-12R 11-12W 11-12SL 11-12L Literacy 11-12RST 1,2,4,7 11-12WHST 2,6,7

Time Frame Unit of Study	Key Questions	Key Learning Targets (Students will know and be able to)	Assessment Evidence of Learning	CCTC Standards	NYS Standards
	special circuits?		<ul style="list-style-type: none"> • Procedure Checklist • Teacher Observation Checklist • Practical Assessment of Wiring Dryers, Hot Water Tanks and Stoves 	Pathway Standards AC-CST 5,8,9 AC-DES 4,8 AC-MO 1,3	Math
Weeks 31-34 Residential Electrical Installation: <ul style="list-style-type: none"> • Overcurrent Protection • Grounding 	<ul style="list-style-type: none"> • What causes overcurrent in electrical circuits? • What are electrical current overcurrent protective devices (OCPDs)? • What are two types of grounding for electrical systems? • What is bonding? • What are two types of circuit interrupters? 	<ul style="list-style-type: none"> • Explain the causes of overcurrent. • List and describe electrical circuit OCPDs. • Describe the rating system for OCPDs. • Explain the operation of a ground-fault circuit interrupter (GFCI) and where it is used. • Explain how an arc-fault circuit interrupter (AFCI) works and the hazards it is designed to prevent. • Explain which branch circuits require an AFCI. • Explain the working principles for electrical grounding. • Describe system grounding and equipment grounding and their purposes. • Define bonding and explain how it is done. 	Written <ul style="list-style-type: none"> • Assignments • Research Project on History of Fuses and Breakers • Quizzes and Tests • Portfolio Update • Self-Assessment Performance <ul style="list-style-type: none"> • Safety Checklist • Procedure Checklist • Teacher Observation Checklist • Practical Assessment on Use of Metering Devices to Determine Breaker Size, Fuse Size and other Overcurrent Protection Devices Needed 	Career Ready Practices CRP 1,2,4,7,8,12 Cluster Standards AC 1,2,3,6 Pathway Standards AC-CST 5,8,9 AC-DES 4,8 AC-MO 1,3	ELA 11-12R 11-12W 11-12SL 11-12L Literacy 11-12RST 1,2,4,9 11-12WHST 2,5,6,7 Math 7.EE.B.3
Weeks 35-38 Residential Electrical Service Design and Installation	<ul style="list-style-type: none"> • What is electrical service? • How do you calculate the size of electrical service? • What are the differences between overhead and underground services per NEC? 	<ul style="list-style-type: none"> • Explain what materials are used for different types of electrical services • Calculate the size of electrical service • Explain the differences between overhead and underground services • Lay out and install a residential electrical service per blueprint, NEC, and Authority Having Jurisdiction (AHJ) 	Written <ul style="list-style-type: none"> • Assignments • Quizzes and Tests • Portfolio Update • Self-Assessment Performance <ul style="list-style-type: none"> • Safety Checklist • Procedure Checklist • Teacher Observation Checklist • Practical Assessment on Installation of Electrical Service as per Given Specifications 	Career Ready Practice CRP 1,2,4,8,12 Cluster Standards AC 1,2,3,6 Pathway Standards AC-CST 3,4,5,7,8,9 AC-DES 4,8 AC-MO 1,3	ELA 11-12R 11-12W 11-12SL 11-12L Literacy 11-12RST 1,2,4,7 11-12WHST 2,6,7 Math
Week 39-40 Review and Final Examination	<ul style="list-style-type: none"> • What knowledge and skills are needed to pass the final exam? 	<ul style="list-style-type: none"> • Review for written final • Practice for hands-on assessment of core electrical tasks on safety and construction 	Written <ul style="list-style-type: none"> • Cumulative Final Exam • Portfolio Update • Self-Assessment Performance <ul style="list-style-type: none"> • Cumulative Practical Assessment 	Career Ready Practice CRP 1,2,4,8 Cluster Standards AC 1,2,3,6 Pathway Standards AC-CST 3,4,5,7,8,9	ELA 11-12R 11-12W 11-12SL 11-12L Literacy 11-12RST 1,2,4,7 11-12WHST 2,6,7 Math

Time Frame Unit of Study	Key Questions	Key Learning Targets (Students will know and be able to)	Assessment Evidence of Learning	CCTC Standards	NYS Standards
				AC-DES 4,7,8 AC-MO 1,3,6	

Syracuse City School District
Career and Technical Education Program
Course Syllabus
ELT 400: Electrical Trades 400



Program Overview

The Electrical Trades Program is a four-year pathway designed to teach students the fundamentals of electricity theory, wiring methods and materials, national and local electrical codes, and print layout, the use of tools and electrical test equipment, the basics of electrical wiring and electrical construction according to the National Electric Code, OSHA 10 Construction Safety certification, and career ready workplace skills. Successful students will have the necessary experience to install receptacles, switches, lighting, and service entrance conductors and work with motors, generators and meters. In the classroom, students will learn both basic electrical theory and get practical hands-on experience, including completing a work-based internship in a local business. Throughout the program students will work both individually and as part of a team to complete assignments and projects. Safety will be given the highest priority at all times as students are working in the classroom. Upon successful completion of the Electrical Trades Program students will be able to obtain entry-level jobs in residential and commercial wiring. Students will also be prepared to continue training and education through post-secondary electrical technology programs at the college level or through private or electrical union apprenticeship programs.

Course Description

This course is designed to educate students in the commercial aspect of the electrical industry. Students will expand on their knowledge of electrical theory and application learned in Electrical Trades 100, 200 and 300. Students will interpret blueprints and specifications appropriate to a commercial setting, and identify the different materials and tools needed for the installation of commercial wiring. As a requirement for the course, students will complete internships with local electrical contractors, complete a professional portfolio and take a national assessment to earn CTE endorsement for graduation. Students who successfully complete ELT 400 are eligible to take the entrance exam for the IBEW (International Brotherhood of Electrical Workers) training program. Those students who pass the entrance exam will be interviewed for admittance to the program and will be on their way to a successful career in the electrical industry.

Pre-Requisites

ELT 100: Electrical Trades 100
ELT 200: Electrical Trades 200
ELT 300: Electrical Trades 300

Course Objectives

Students will:

- Gain essential employability skills.
- Obtain OSHA 10 certification.
- Understand electrical theory in a commercial setting.
- Know how to navigate through the NEC.
- Gain experience with motor control.
- Understand different types of transformers and ratings.
- Understand NEMA ratings for different commercial materials.
- Complete a professional portfolio.
- Pass a national assessment of knowledge and skills in Electrical trades.

Integrated Academics

1 CTE Integrated English Credit

Equipment and Supplies

- **School will provide:** Complete set of electrical hand tools, power tools, and personal protective equipment.
- **Student will provide:** work boots or safety shoes

Textbook

Holzman, H. N. (2018). *Modern Commercial Wiring, 7th Edition*. Tinley Park, IL: Goodheart-Willcox Company, Inc.

Grading

20%	Quizzes/Projects
10%	Homework
25%	Weekly Participation
25%	Labs
20%	Tests and Unit Exams

Additional Course Policies

Student attendance is very important due to the mandatory hours required for the national assessment. The absentee policy is strictly enforced.

Course Calendar

Quarter	Units of Study
1	<ul style="list-style-type: none">• Electrical Fundamentals:<ul style="list-style-type: none">○ Shop Safety○ Power and Specialized Tools○ Career and Communication Skills○ Professional Organizations• Commercial Electrical Print Specifications and Codes• Specialized Industrial Wiring Methods• Commercial Materials: Boxes and Conduit Bodies
2	<ul style="list-style-type: none">• Commercial Electrical Installation:<ul style="list-style-type: none">○ Overcurrent Protection○ Service Distribution○ Transformers○ Branch Circuits and Feeders
3	<ul style="list-style-type: none">• Commercial Electrical Installation: Electrical Motors Installation, Troubleshooting and Repair• Specialized Commercial Installations
4	<ul style="list-style-type: none">• Alternative Energy Sources• Internships• Review of All Electrical Construction, Maintenance and Repair• Pre-Employment Exam for IBEW• Review and Final Examination

Syracuse City School District
Career and Technical Education Program
Scope and Sequence
ELT 400: Electrical Trades 400



Time Frame Unit of Study	Key Questions	Key Learning Targets (Students will know and be able to)	Assessment Evidence of Learning	CCTC Standards	NYS Standards
Weeks 1-3 Electrical Fundamentals: <ul style="list-style-type: none"> • Shop Safety • OSHA 10 Construction Certification • Power and Specialized Tools • Career and Communication Skills • Professional Organizations 	<ul style="list-style-type: none"> • Why is safety important in the electrical industry? • What algebraic equations are needed to complete electrical tasks? • What power tools are used in the electrical trades? • What skills are needed to obtain a job in the electrical industry? • What professional organizations set standards for the electrical industry? 	<ul style="list-style-type: none"> • List basic shop safety rules. • Maintain safety practices and procedures during electrical installations. • Describe principles of safe tool use and maintenance. • Describe tools used for both essential and more specialized electrical installations including tools for making electrical measurements. • Explain the skills need to both obtain and retain jobs in the electrical industry. • Identify professional organizations in the electrical industry. 	Written <ul style="list-style-type: none"> • Assignments • Research Project on the Five Sources of Energy • Quizzes and Tests • OSHA 10 Construction Certification Summative Assessment • Self-Assessment Performance <ul style="list-style-type: none"> • Safety Checklist • Procedure Checklist • Teacher Observation Checklist • Practical Tool Identification Test 	Career Ready Practices CRP 1,2,4,8,10,12 Cluster Standards AC 1,3,4,7 Pathway Standards AC-CST 5,8,9 AC-DES 2,4,8 AC-MO 1,6	ELA 11-12R 11-12W 11-12SL 11-12L Literacy 11-12RST 1,2,4,7,9 11-12WHST 2,5,6,7 Math
Weeks 4-5 Commercial Electrical Print Specifications and Codes	<ul style="list-style-type: none"> • What is the importance of electrical drawings and prints? • What is the purpose of the National Electric Code (NEC)? • What agencies set standards for electrical practices and procedures? • What safety and performance testing is performed on electrical devices, equipment and components? 	<ul style="list-style-type: none"> • Describe several types of electrical drawings. • Identify common electrical symbols. • Explain the purpose of specifications. • Explain the importance of building codes. • Define the purpose, intent, arrangement, and key terminology of the NEC. • Name various agencies that set standards concerning electrical practices and procedures. • Identify various lab facilities that perform rigorous testing on electrical devices, equipment, and associated components for safety and performance certification. 	Written <ul style="list-style-type: none"> • Assignments • Quizzes and Tests • Self-Assessment Performance <ul style="list-style-type: none"> • Safety Checklist • Procedure Checklist • Teacher Observation Checklist • Practical Assessment on Design of Legend, Keys and Symbols for Specific Prints 	Career Ready Practices CRP 1,2,4,8,12 Cluster Standards AC 1,3,6 Pathway Standards AC-CST 5,8,9 AC-DES 2,4,7,8 AC-MO 1,6	ELA 11-12R 11-12W 11-12SL 11-12L Literacy 11-12RST 1,2,4,7,9 11-12WHST 2,6,7 Math
Weeks 5-8 Specialized Industrial Wiring Methods	<ul style="list-style-type: none"> • What wiring methods are available for commercial installations? • What are the rules for commercial wiring methods? • What are the important components of each wiring method? • What is the purpose of the different types of wiring 	<ul style="list-style-type: none"> • List the wiring methods available for commercial installation and the rules regarding each method of wiring. • Size wireways to satisfy Code requirements. • Identify fittings, connectors, supports, and other integral hardware unique to a particular wiring method. • Select the correct wiring method based on Code requirements. 	Written <ul style="list-style-type: none"> • Assignments • Quiz and Tests • Self-Assessment Performance <ul style="list-style-type: none"> • Safety Checklist • Procedure Checklist • Teacher Observation Checklist • Practical Assessment on 	Career Ready Practices CRP 1,2,4,8,12 Cluster Standards AC 1,3,6 Pathway Standards AC-CST 5,8,9	ELA 11-12R 11-12W 11-12SL 11-12L Literacy 11-12RST 1,2,4,7,9 11-12WHST 2,6,7 Math 2.MD.A.1

Time Frame Unit of Study	Key Questions	Key Learning Targets (Students will know and be able to)	Assessment Evidence of Learning	CCTC Standards	NYS Standards
	hardware? <ul style="list-style-type: none"> What are the Code requirements for different wiring methods? 	<ul style="list-style-type: none"> Calculate wireway size. 	Identifying Industrial Materials, Bending EMT, Rigid and PVC Conduit	AC-DES 2,4,8 AC-MO 1,3,6	7.EE.B.3
Weeks 9-10 Commercial Materials: Boxes and Conduit Bodies/Condulets	<ul style="list-style-type: none"> What is the purpose of different types of boxes and conduit bodies/condulets? How are materials selected for various types of applications? What are the Code requirements for different types of boxes and conduit bodies/condulets? 	<ul style="list-style-type: none"> Identify different types of boxes. Select boxes for various applications. Explain how boxes are grounded. Mount and support boxes in accordance with the Code. Identify various types of conduit bodies. Perform box fill calculations using the Code. Compute box sizes for straight and angular pulls. 	Written <ul style="list-style-type: none"> Assignments Quiz and Tests Self-Assessment Performance <ul style="list-style-type: none"> Safety Checklist Procedure Checklist Teacher Observation Checklist Practical Assessment on Installation of Condulets 	Career Ready Practices CRP 1,2,4,8,12 Cluster Standards AC 1,3,6 Pathway Standards AC-CST 5,8,9 AC-DES 2,4,8 AC-MO 1,3,6	ELA 11-12R 11-12W 11-12SL 11-12L Literacy 11-12RST 1,2,4,7,9 11-12WHST 2,6,7 Math 7.EE.B.3
Weeks 11-14 Commercial Electrical Installation: <ul style="list-style-type: none"> Overcurrent Protection Service Distribution Transformers 	<ul style="list-style-type: none"> What are the characteristics of different types of electrical protective devices? What is the difference between fuses and circuit breakers? What are the common applications of various supply voltages available in the United States? What is the purpose and uses of transformers? 	<ul style="list-style-type: none"> Identify the types, ratings, and characteristics of electrical protective devices. Recognize overloads and short circuits. List types of fuses. Compare fuses and circuit breakers. Describe the two basic types of service. Explain service terminology. Find service drop clearance in the Code. Compare the arrangement and construction of service drops and service laterals. Identify the required working clearances at the service equipment. Explain the various supply voltages available in the United States and their common applications. Define the purpose and uses of transformers. Identify the basic components and construction of a transformer. Explain how a transformer works. List the types of transformers. Size overcurrent protective devices for transformer primaries and secondaries. Perform transformer calculations and solve practical transformer problems. 	Written <ul style="list-style-type: none"> Assignments Quizzes and Tests Written Assessment on Proper Sizing of Transformer and Overcurrent Protection Self-Assessment Performance <ul style="list-style-type: none"> Safety Checklist Procedure Checklist Teacher Observation Checklist Practical Assessment on proper Installation of Transformer and Overcurrent Protection 	Career Ready Practices CRP 1,2,4,8,12 Cluster Standards AC 1,3,6 Pathway Standards AC-CST 5,8,9 AC-DES 2,4,8 AC-MO 1,3,6	ELA 11-12R 11-12W 11-12SL 11-12L Literacy 11-12RST 1,2,4,7,9 11-12WHST 2,6,7 Math 2.MD.A.1 7.RP.A.3
Weeks 15-20 Commercial Electrical	<ul style="list-style-type: none"> What are the components of a distribution system? What are the various types of branch circuits? 	<ul style="list-style-type: none"> Identify the feeder and branch circuit portions of a distribution system. Describe the various types of branch circuits. 	Written <ul style="list-style-type: none"> Assignments Quizzes and Tests Self-Assessment 	Career Ready Practices CRP 1,2,4,8,12	ELA 11-12R 11-12W 11-12SL 11-12L

Time Frame Unit of Study	Key Questions	Key Learning Targets (Students will know and be able to)	Assessment Evidence of Learning	CCTC Standards	NYS Standards
Installation: Branch Circuits and Feeders Participation in Regional Skills USA Competition	<ul style="list-style-type: none"> • What are the functions of feeders and branch-circuit conductors? • How are feeder conductors sized? 	<ul style="list-style-type: none"> • Define the functions of a feeder and the functions of branch-circuit conductors. • Calculate lighting and receptacle loads using Code requirements. • Size branch circuits in accordance with the Code. • Determine branch circuit overcurrent protection required by the Code. • Use the Code to size feeder conductors. 	Performance <ul style="list-style-type: none"> • Safety Checklist • Procedure Checklist • Teacher Observation Checklist • Practical Assessment on Identifying Proper Branch Feeders and Wire for Project • Skills USA Competition 	Cluster Standards AC 1,2,3,6	Literacy 11-12RST 1,2,4,7,9 11-12WHST 2,6,7
				Pathway Standards AC-CST 5,8,9 AC-DES 2,4,8 AC-MO 1,3,6	Math 2.MD.A.1 7.EE.B.3
Weeks 21-28 Commercial Electrical Installation: Electrical Motors Installation, Troubleshooting and Repair	<ul style="list-style-type: none"> • What are the basic classes and components of motors? • What is the difference between true power, apparent power, and power factor? • What is the difference between manual and magnetic starters? • How is the proper overcurrent protection and conductor sizes for a control circuit determined? 	<ul style="list-style-type: none"> • Explain the basic components of motors. • List various classes of motors. • Calculate motor starting currents. • Use the Code to design motor branch circuits, including overcurrent protection. • Define and compute true power, apparent power, and power factor. • List Code requirements for motor controls and motor control circuits. • Determine the proper overcurrent protection and conductor sizes for a control circuit. • Identify several types of pilot devices. • Read control circuit diagrams. • Reverse motor direction by switching connections. • Describe basic motor control center setup. 	Written <ul style="list-style-type: none"> • Assignments • Quizzes and Tests • Self-Assessment Performance <ul style="list-style-type: none"> • Safety Checklist • Procedure Checklist • Teacher Observation Checklist • Practical Assessment on Proper Sizing, Rotation, and Installation of Motors 	Career Ready Practices CRP 1,2,4,8,12	ELA 11-12R 11-12W 11-12SL 11-12L
				Cluster Standards AC 1,3,6	Literacy 11-12RST 1,2,4,7,9 11-12WHST 2,6,7
				Pathway Standards AC-CST 5,8,9 AC-DES 2,4,8 AC-MO 1,2,3,6	Math 7.EE.B.3 A.REI.A.1 A.REI.A.2 A.REI.B.3 A.REI.B.4 2.MD.A.1
Weeks 29-32 Specialized Commercial Installations Alternative Energy Sources	<ul style="list-style-type: none"> • What are the requirements of installations around pools and hot tubs? • What are some alternative energy sources in use today? • What are the considerations when installing or troubleshooting alternative energy sources? 	<ul style="list-style-type: none"> • Describe the requirements for receptacles and luminaire placement around pools. • Describe various types of underwater luminaire. • Identify limitations and clearances for conductors passing over pools. • List the Code rules for bonding and grounding equipment near a pool. • Identify the Code requirements for spa and hot tub installation. • Describe various alternative energy sources. • Size a generator for a residential system. • Calculate the return on wind turbines. 	Written <ul style="list-style-type: none"> • Assignments • Research Project alternative energies used in local area and which are most efficient for local conditions • Test • Self-Assessment Performance <ul style="list-style-type: none"> • Safety Checklist • Procedure Checklist • Teacher Observation Checklist 	Career Ready Practices CRP 1,2,4,5,8,12	ELA 11-12R 11-12W 11-12SL 11-12L
				Cluster Standards AC 1,3,6	Literacy 11-12RST 1,2,4,7,9 11-12WHST 2,5,6,7
				Pathway Standards AC-CST 5,8,9 AC-DES 2,4,8 AC-MO 1,3,6	Math 2.MD.A.1 7.RPA.3
Weeks 33-36 Internships	<ul style="list-style-type: none"> • How preparation is needed for a particular career choice? 	<ul style="list-style-type: none"> • Apply job search techniques to seek out, evaluate and obtain internship 	Written <ul style="list-style-type: none"> • Self-Assessment 	Career Ready Practices CRP 1,2,4,8,10,12	ELA 11-12R 11-12W

Time Frame Unit of Study	Key Questions	Key Learning Targets (Students will know and be able to)	Assessment Evidence of Learning	CCTC Standards	NYS Standards
Review of All Electrical Construction, Maintenance and Repair Pre-Employment Exam for IBEW	<ul style="list-style-type: none"> Why are successful job-seeking skills required in a competitive marketplace? How does an electrician convey professionalism in the workplace? Why are internships necessary? How does an internship experience contribute to a professional portfolio? What were areas of improvement and challenges during the internship experience? What were the main learning goals for this past year? 	<ul style="list-style-type: none"> opportunities. Communicate with industry/potential employers through the internship experience. Apply knowledge and skills from the classroom to workplace situations. Explain the importance of professionalism and ethics in the workplace. Comply with workplace policies and regulations. Communicate effectively both verbally and in writing with coworkers and customers. Explain the importance of being prompt, being able to take directions and being motivated to accomplish assigned tasks. Analyze and resolve problems that arise in completing assigned tasks. Update online professional portfolio and employability profile. Review knowledge and skills from the program in preparation for IBEW Pre-Employment Exam, Final Examination and NOCTI Assessment. 	<ul style="list-style-type: none"> Reflection Summary: Internship Experience Professional Portfolio Employability Profile IBEW Pre-Employment Exam <p>Performance</p> <ul style="list-style-type: none"> Internship Checklist Safety Checklist Procedure Checklist Teacher Observation Teacher Checklist 	<p>Cluster Standards AC 1,3,6,7</p> <p>Pathway Standards AC-CST 5,8,9 AC-DES 2,4,8 AC-MO 1,3,6</p>	<p>11-12SL 11-12L</p> <p>Literacy 11-12RST 1,2,4,7,9 11-12WHST 2,6,7</p> <p>Math</p>
Week 39-40 Review and Final Examination	<ul style="list-style-type: none"> What knowledge and skills are needed to pass the final exam? 	<ul style="list-style-type: none"> Review for written final. Practice for hands-on assessment of core electrical tasks on safety and construction. 	<p>Written</p> <ul style="list-style-type: none"> Self-Assessment Skills USA Written Assessment Portfolio Completion <p>Performance</p> <ul style="list-style-type: none"> Safety Checklist Procedure Checklist Teacher Observation Teacher Checklist Skills USA Performance Assessment 	<p>Career Ready Practices CRP 1,2,4,8,12</p> <p>Cluster Standards AC 1,2,3,4,6,7</p> <p>Pathway Standards AC-CST 5,8,9 AC-DES 2,4,7,8 AC-MO 1,2,3,6</p>	<p>ELA 11-12R 11-12W 11-12SL 11-12L</p> <p>Literacy 11-12RST 1,2,4,7,9 11-12WHST 2,6,7</p> <p>Math</p>