Connecticut Technical Education and Career System

Connecticut-SDE

Electrical Apprenticeship Information Packet

State of Connecticut Electrical Apprenticeship Information Packet 18-19
Connecticut Technical Education & Career System
Connecticut State Department of Education

Electrical APPRENTICESHIP INFORMATION PACKET

2018-19

Covering the following licenses:
E-2 Electrician
L-6 Low Voltage
T-2 Telephone Interconnect
C-6 Telephone Interconnect/Low Voltage
PV-2 Limited Solar Electric Journeyperson
Concerning related classroom instruction, each apprentice student is expected:

- To purchase the textbooks required for each course
- To complete all instructor assigned quizzes and exams as well as any academic reinforcement activities.

Student Responsibility Enrollment and Attendance:

- Students are held responsible for making informed enrollment decisions and for knowledge of and compliance with CTHSS policies and procedures, current printed class schedule as well as special registration instructions which may be issued on a semester-by-semester basis.

ATTENDANCE:

Based on 3 hour class sessions, the following is a list of total hours in a course and the maximum number of allowed absences (by number of classes) prior to denial of credit:

<table>
<thead>
<tr>
<th>Total hours in classes</th>
<th>Maximum absences</th>
<th>Total hours in classes</th>
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Excessive tardiness and/or early departures will be addressed on an individual basis and may cause denial of credit; example being marked tardy for 3-1 hour incidents will equate to an absence.

Employers have the right to verify their employee's attendance in a program.

**NOTE: A minimum grade of 75% is necessary to pass each course.**

All trade area content is based on a strong mathematical foundation. For this reason the baseline for transfer credit needs to be set to a higher standard, as well as being recent. Basic Math transfer credit may be awarded with a minimum of an ‘85’ average completed in a comparable course, and taken within the last five years from date request for credit is submitted. All communications will need to be forwarded through the apprentice school supervisor at the local school. For perusal of waiver, please provide the apprentice school supervisor with the following:

- Transcripts detailing grades earned in the course, showing a minimum proficiency level of an ‘85’ or better.
- Course description from institution listed on transcripts.

**Electrical Algebra w/Trig requirements**

*Electrical Algebra w/Trig Requirements Course* substitution: Academic transcripts showing successful completion of an academic Algebra course **cannot** be substituted for the required thirty-six hour *Electrical Algebra w/Trig* requirements (A0005) course. Please be advised this is **not permissible**, as just holding a high school/college transcript or report card is not an allowable substitution for this course.
The following section, Apprentice Responsibilities, is taken from the *State of Connecticut-Apprentice Handbook & Progress Report*, which is given to each apprentice at the beginning of their training by the Office of Apprenticeship Training, Connecticut State Labor Department.

Apprentice Responsibilities:
1. Work safely.
2. Avoid absenteeism and tardiness at work and at school.
3. Attend and participate in related instruction and maintain the highest possible grades.
4. Be involved and show dedication to your training (both on the job and in the classroom).
5. Keep track of your training hours, (either in the form of work records or logbook) and advise your supervisor of any deficiencies in your apprenticeship training.
6. Show dedication and interest in learning the trade.
7. Show respect to the skilled journeypersons training and supervising you.
8. Comply with the provisions of the Apprentice Agreement.
9. Follow your sponsor’s written work rules and policies.
10. You must be accompanied by a journeyperson while on the job site.
Regional Apprenticeship Representatives
Office of Apprenticeship Training
Department of Labor
860-263-6085

Contact information and region assigned:

Region 1: Paul Femia, paul.femia@ct.gov (860) 263-6128

Region 2: Larry Satchell, larry.satchell@ct.gov (860) 263-6084

Region 3: Owen Golding, owen.golding@ct.gov (860) 263-6083

Region 4: Gina Knox, gina.knox@ct.gov (860) 263-6277

Region 5: Tammie Whiting, tammie.whiting@ct.gov (860) 263-6154

Region 6: Isaiah Curtis, Isaiah.curtis@ct.gov (860) 263-6042

Statewide: Keri Lamontagne, keri.lamontagne@ct.gov (860) 263-6129

Towns Served:

<table>
<thead>
<tr>
<th>Statewide</th>
<th>Manufacturing</th>
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Towns and Cities by Regional DOL Rep located on the following page:
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Electrical Work Licenses: Licenses Expire annually: September 30th
Section 20-330 of the Connecticut General Statutes
"Electrical work" means the installation, erection, maintenance, alteration or repair of any wire, cable, conduit, busway, raceway, support, insulator, conductor, appliance, apparatus, fixture or equipment which generates, transforms, transmits or uses electrical energy for light, heat, power or other purposes.

**E-1 Unlimited Electrical Contractor**
The holder of this license may do all electrical work as defined in section 20-330 of the General Statutes.

**E-2 Unlimited Electrical Journeyperson**
The holder of this license may do the same work as an E-1 licensee, but only while in the employ of a contractor licensed for such work.

**L-5 Limited Electrical Contractor**
The holder of this license may perform only work limited to ADT, similar or low voltage signal work, audio and sound systems. The installation or repair of any electrical work for plating or similar low voltage work is not authorized. The voltage of the system is not to exceed 25 volts or five amperes where such work commences at an outlet receptacle or connection previously installed by a person holding the proper electrical license.

**L-6 Limited Electrical Journeyperson**
The holder of this license may perform the same work as the L-5 licensee, but only while in the employ of a contractor licensed for such work.

**C-5 Limited Electrical Contractor**
The holder of this license may perform only work limited to ADT, similar or low voltage signal work, audio and sound systems, and telephone-interconnect systems. The installation, repair, maintenance of any electrical work for plating is not authorized. The voltage of any system is not to exceed forty-eight (48) volts or five (5) amperes where such work commences at an outlet receptacle or connection previously installed by a person holding the proper electrical license.

**C-6 Limited Electrical Journeyperson**
The holder of this license may perform the same work as the C-5 licensee, but only while in the employ of a contractor licensed for such work.

**T-1 Limited Electrical Contractor**
The holder of this license may perform only work limited to telephone-interconnect systems where such work commences at an outlet receptacle or connection previously installed by a person holding the proper electrical license.

**T-2 Limited Electrical Journeyperson**
The holder of this license may perform the same work as the T-1 licensee, but only while in the employ of a contractor licensed for such work.

**PV-1 LIMITED SOLAR ELECTRIC CONTRACTOR**
The holder of this license may perform only work limited to Solar Electric systems; which means the installation, erection, repair, replacement, alteration or maintenance of photovoltaic or wind generation systems, including storage and distribution of such energy for heat, light, power or other purposes to a point immediately inside a structure or adjacent to an end use. The requirements to qualify for this license examination shall be two years as a solar journeyperson or equivalent experience and training.

**PV-2 LIMITED SOLAR ELECTRIC JOURNEYPERSON**
The holder of this license may perform only work limited to Solar Electric systems; which means the installation, erection, repair, replacement, alteration or maintenance of photovoltaic or wind generation systems, including storage and distribution of such energy for heat, light, power or other purposes to a point immediately inside a structure or adjacent to an end use and only while in the employ of a licensed electrical contractor. The requirements to qualify for this license examination shall be the completion of a registered apprenticeship program or equivalent experience and training.
## E-2 ELECTRICAL APPRENTICESHIP
### COURSE SEQUENCE AND PREREQUISITES

<table>
<thead>
<tr>
<th>COURSES (EACH COURSE IS 36 HOURS)</th>
<th>Course number</th>
<th>Semester</th>
<th>Prerequisites</th>
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<td>Basic Math Computations</td>
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<td>Electrical Algebra w/Trig</td>
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<td>A0001</td>
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<tr>
<td>Electrical Theory I</td>
<td>A0901</td>
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<td>OSHA-30</td>
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### T-2 Telephone Interconnect Electrical Apprenticeship

**COURSE SEQUENCE AND PREREQUISITES**

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### L-6 Low Voltage Electrical Apprenticeship

**COURSE SEQUENCE AND PREREQUISITES**

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### C-6 Telephone Interconnect/Low Voltage Electrical Apprenticeship

**COURSE SEQUENCE AND PREREQUISITES**

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<tr>
<td>Electrical Code I</td>
<td>A0904</td>
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<td>OSHA-30</td>
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<tr>
<td>Basic Alarm Technology</td>
<td>A0927</td>
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<td>Basic Telecommunications</td>
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<td>Fire, Access &amp; CCTV Systems</td>
<td>A0928</td>
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<td>Electrical Theory II</td>
<td>A0902</td>
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<td>A0901</td>
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<tr>
<td>Telecom Cabling</td>
<td>A0925</td>
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**Effective- July 10, 2009**  
**Electrical Apprentice Curriculum**  
**Related Instruction Credit Award**

### PV-2 ELECTRICAL APPRENTICESHIP  
**OJT-4000 Hours**  **Related Instruction- 360 Hours**

<table>
<thead>
<tr>
<th>COURSES (EACH COURSE IS 36 HOURS)</th>
<th>Course number</th>
<th>Semester</th>
<th>Prerequisites</th>
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<tr>
<td><strong>FIRST YEAR COURSES:</strong></td>
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<tr>
<td>Basic Math Computations</td>
<td>A0001</td>
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<td>Blueprint Reading</td>
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<td>Electrical Code I</td>
<td>A0904</td>
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<td>Building Trade Safety / OSHA-30 (eff. 9/1/13)</td>
<td>A0099</td>
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<td><strong>SECOND YEAR COURSES:</strong></td>
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<td>Electrical Code II</td>
<td>A0905</td>
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<td>Electrical Code IV</td>
<td>A0910</td>
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<tr>
<td>Power Distribution and Load Calculations</td>
<td>A0917</td>
<td>2</td>
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</tbody>
</table>
Course Outlines

NOTE: Each apprentice student is expected to complete all instructor assigned quizzes and exams as well as any academic reinforcement activities. **A minimum grade of 75% is necessary to pass each course.**

E-2 Electrical Curriculum
Related Instruction-720 Hours

Table of Contents

Course: Basic Math Computations A0001 36 Hours
A. Computations Using Real Numbers
B. Computations Using Fractions
C. Computations Using Decimal Fractions
D. Base, Rate, and Portion
E. Computation of Area and Volume
F. Units of Measurements

Course: Blueprint Reading A0031 36 Hours
A. Application of Building Codes and Standards
B. Introduction to Blueprint Reading
C. Alphabet of Lines and Symbols
D. Orthographic Projection Drawings
E. Construction Dimensions and Construction Materials
F. Reading Plot Plans and Contour Maps
G. Footings, Foundations and Floor Blueprint Structural Steel, Framing Blueprints
H. Plumbing System Blueprints
I. H.V.A.C. System Blueprints
J. Electrical Systems Blueprints

Course: Electrical Algebra with Trigonometry A0005 36 Hours
Prerequisite: Basic Math Computations
A. Power and Roots
B. Groupings
C. Addition, Subtraction, Multiplication and Division of Polynomials
D. Solving Word Problems
E. Identifying Triangles and Angles
F. Pythagorean Theorem
G. Trigonometric Functions, Sines, Cosines & Tangents
H. Solution of Problems
I. Ohm's Law Electrical Math
J. Voltage Drop Calculations
K. Single phase and three phase voltage drop
L. Conductor sizing
M. Inductance
N. Capacitance
O. Kirchhoff’s Laws
Course: Electrical Theory I  
A0901  36 Hours

A. Introduction to Electricity and Matter  
B. Electricity Production and Use  
C. Electrostatics and Basic Circuit Concepts  
D. Scientific Notation and Metric Prefixes  
E. Electric Measurements  
F. Conductors, Resistance & Insulators  
G. OHM’s Law, Electrical Power and Energy  
H. Series Circuit Calculations  
I. Parallel Circuit Calculations  
J. Series – Parallel Circuits

Course: OSHA-30  
A0099  36 Hours

A. Introduction to OSHA – 2 hours  
B. Managing Safety and Health – 2 hours  
C. OSHA Focus Four Hazards – 6 hours  
  a. (1) Falls (minimum one hour and 15 minutes)  
  b. (2) Electrocution  
  c. (3) Struck-By (e.g., falling objects, trucks, cranes)  
  d. (4) Caught-In or Between (e.g., trench hazards, equipment)  
D. Personal Protective and Lifesaving Equipment – 2 hours  
E. Health Hazards in Construction – 2 hours  
F. Stairways and Ladders – 1 hour.  
G. Electives - 12 hours  
  a. Concrete and Masonry Construction  
  b. Confined Space Entry  
  c. Cranes, Derricks, Hoists, Elevators, & Conveyors  
  d. Ergonomics  
  e. Excavations  
  f. Fire Protection and Prevention  
  g. Materials Handling, Storage, Use and Disposal  
  h. Motor Vehicles, Mechanized Equipment and Marine Operations; Rollover  
     Protective Structures and Overhead Protection; and Signs, Signals and  
     Barricades  
  i. Powered Industrial Vehicles  
  j. Safety and Health Programs  
  k. Scaffolds  
  l. Steel Erection  
  m. Tools - Hand and Power  
  n. Welding and Cutting

Course: Electrical Code I  
A0904  36 Hours

A. Articles 80-225, 300-310 & Chapter 9

Course: Telecom Cabling  
A0925  36 Hours

A. Telephone Cable  
B. Connection Methods
C. Distribution
D. LAN Cabling
E. Grounding
F. Telecom Code

Course: Electrical Code II  A0905  36 Hours

Prerequisite: Code I
A. Articles 230-427 & Chapter 9

Course: Basic Telecommunications  A0924  36 Hours
A. Describing basic telephone terms and their usage
B. Ohms Law and Circuits
C. Dial Tone and Components of a Telephone
D. LATAs Local Access Transport Area. Placing a Local Phone Call
E. LD Network and Preferred Inter-exchange carrier. Placing a Long Distance Phone Call
F. Understanding POTS Lines
G. The Telecom Landscape – The Players
H. The Telecom Landscape – The Customers
I. Basic Voice Network Concepts
J. Fundamentals of Transmission Systems
K. Fundamentals of Data Communications
L. Fundamentals of LANs
M. ISDN BRI and PRI Lines
N. Private Line Services
O. Understanding Key Systems
P. What is a PBX?
Q. Voice Mail Integration with Key Systems and PBXs

Course: Electrical Theory II  A0902  36 Hours

Prerequisite: Electrical Theory I
A. Introduction to Alternating Current
B. Alternating-Current Circuits Containing Resistance and Inductance in Alternating – Current Circuits
C. Series Circuits – Resistance and Impedance and Resolving Vectors
D. Capacitors, dielectric of capacitors, elementary functions of each part. Capacitors connected in series and parallel. Also RC and RL time constants
E. Capacitors in alternating current circuits. Capacitive reactance
F. Series Circuits: Resistance, Inductive Reactance, and Capacitive Reactance
G. AC parallel circuits with branches containing resistance, inductance and capacitance

Course: Electrical Code III  A0909  36 Hours

Prerequisite: Code I & II
A. Articles 430 Motors – 490 Equipment over 600 volts

Course: Motor Controls  A0906  36 Hours
A. Tools, Instruments and Safe Work Habits.
B. Control Language, Symbols and Diagrams
C. Logic Applied to Control Circuits
D. Motor Control, Control Devices.
E. Control Circuits
F. Troubleshooting Control Circuits

Course: Basic Alarm Technology A0927 36 Hours

A. Terms & Definitions: Describing basic alarm terms and their usage.
B. Basic Electronic Theory: Ohms Law and Circuits
C. Perimeter Protection: Perimeter devices and sensors
D. Sound Protection: Sound devices and sensors
E. Interior Protection: Interior devices and sensors.
F. Control Panel Features: Control Panel and Key Pad functionality.
G. TELCO Connection with an RJ31X and line seizure. The Central Station

Course: Semiconductors for Electricians A0908 36 Hours

A. Electrical Safety
B. PC Board Construction and Repairs.
C. Semiconductors and Diodes
D. DC Power Supplies, Transducers, and Transistors
E. Integrated Circuits, specific Inputs and Outputs

Course: Logic Circuits-Programmable Controllers, Part I A0914 36 Hours

Prerequisite: Motor Controls

A. Introducing Logic and the PLC Number System
B. Symbols, Truth Tables, and Logic
C. Boolean Algebra, Logic circuits and PLC operation
D. Introduction to Logic and PLC Operation
E. Data Organization, Programming

Course: Logic Circuits-Programmable Controllers, Part II A0926 36 Hours

Prerequisite: Logic Circuits Part I

A. Relay Programming Instructions
B. Understanding Safe and Proper Programming
C. Documenting your system
D. Comparing, Timers, Counters, and Data Handling Instructions.
E. Troubleshooting, Debugging and Diagnostic Capabilities

Course: Motor and Generator Theory A0907 36 Hours

A. Introduction to Generators
B. Types of Motors
C. Single-Phase Motors
D. Polyphase Motors
E. Reviewing Motor Circuit Calculations
Course: Fire, Access & CCTV Systems          A0928          36 Hours

A. Terms & Definitions: Describing Basic Fire Alarm Terms and their usage  
B. Basic Elements and CPU Features  
C. Signal Initiation and Types of Initiating Devices  
D. Notification Appliances and Extinguishing Systems  
E. System Design, Approvals, Authorities and Acceptance  
F. Testing and Maintenance  
G. Introduction to Access Control and Forms of Access Control  
H. Access Control Major Devices  
I. Access Control Controller, Software, Code Compliance and Wiring Standards  
J. Common Types of CCTV  
K. CCTV Basic Components  
L. CCTV Basic Technology

Course: Electrical Code IV               A0910          36 Hours

Prerequisite: Code I, II & III

A. Hazardous Locations and Special Occupancies, Articles 500-516  
B. Health Care Facilities, Article 517  
C. Special Occupancies, Articles 518-555  
D. Special Equipment, Article 600-695  
E. Special Conditions, Article 700-780  
F. Communication Systems, Articles 800-830  
G. Tables & Annex  
H. Code Review

Course: Power Distribution and Load Calculations          A0917          36 Hours

A. Voltage Drop and Wire Sizes  
B. Power Transformers  
C. Three-Phase Power  
D. Poly Phase Systems  
E. Special Transformer Connections and Harmonics  
F. Power Factor Correction  
G. Load Calculations – Small Commercial Building – Phase I  
H. Load Calculations – Small Commercial Building – Phase II
Required Booklist for Electrical Apprentice Students:
Following are the required textbooks that each student must purchase for each course.

**PLEASE NOTE: The current CT. adopted National Electric Code must be brought to all Electrical Theory and Blueprint Reading Courses.**

For Low Voltage C-6 License Apprentice Coursework,

For Low Voltage L-6 License Apprentice Coursework,


For Telephone Interconnect T-2 License Apprentice Coursework,

- CFR 47 PART 68—Connection of Terminal Equipment to the Telephone Network, 2002
- Ugly’s Electrical References, George V. Hart, 2011 or 2014, Jones and Bartlett, (800) 832-0034, www.uglys.net
- ANSI/NECA/BICSI 568-2006, Standard for Installing Commercial Building Telecommunications Cabling BICSI, 8610 Hidden River Parkway, Tampa, FL 33637-1000, Phone: 800.242.7405 Email: customerservice@bicsi.org, https://www.bicsi.org
For Solar Photovoltaic PV-2 License Apprentice Coursework,

- Ugly’s Electrical References, George V. Hart, 2011 or 2014, Jones and Bartlett, (800) 832-0034, www.uglys.net. All items are based on either the current last two editions.
- Practical Photovoltaics, Electricity from Solar Cells, 2002, Richard J. Komp, Ph.D. AATEC Publications, P.O.Box 7119, Ann Arbor, MI 48107 (800) 995-1470.

For Unlimited Electrical Apprenticeship Coursework, E-2

- Ugly’s Electrical References, George V. Hart, 2011 or 2014, Jones and Bartlett, (800) 832-0034, www.uglys.net. All items are based on either the current last two editions.
<table>
<thead>
<tr>
<th>Book Publishers</th>
<th>Phone Numbers</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goodheart-Willcox</td>
<td>1-800-323-0440</td>
<td><a href="http://www.goodheartwillcox.com">www.goodheartwillcox.com</a></td>
</tr>
<tr>
<td>Thomson Delmar Learning</td>
<td>1-800-347-7707</td>
<td><a href="http://www.delmarlearning.com">www.delmarlearning.com</a></td>
</tr>
<tr>
<td>National Fire Protection Association (NFPA)</td>
<td>1-800-344-3555</td>
<td><a href="http://www.nfpa.org/index.asp">www.nfpa.org/index.asp</a></td>
</tr>
<tr>
<td>American Technical Publishers</td>
<td>1-800-323-3471</td>
<td><a href="http://www.go2atp.com">www.go2atp.com</a></td>
</tr>
<tr>
<td>International Code Council (ICC)</td>
<td>1-800-786-4452</td>
<td><a href="http://shop.iccsafe.org/">http://shop.iccsafe.org/</a></td>
</tr>
<tr>
<td>CRC Press</td>
<td>1-800-272-7737</td>
<td><a href="https://www.crcpress.com/">https://www.crcpress.com/</a></td>
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<tr>
<td>Amazon Bookstore</td>
<td>1-800-201-7575</td>
<td><a href="http://www.amazon.com">www.amazon.com</a></td>
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<tr>
<td>Prentice Hall</td>
<td>1-800-282-0693</td>
<td><a href="http://vig.prenhall.com/catalog/">http://vig.prenhall.com/catalog/</a></td>
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BOOK PUBLISHERS PHONE ORDER NUMBERS & WEBSITES