



# Apprenticeship Development and Professional Training Company Curriculum

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## WORK PROCESS SCHEDULE & RELATED TECHNICAL INSTRUCTION (RTI)

**Occupation Title: Qualified Energy Technician – Electrician**

*(Photovoltaic Systems & Energy Storage Systems)*

**O\*NET-Related:** 47-2111.00 (Electricians)

**RAP Code:** To Be Assigned

**Term of Apprenticeship:** 8,000 Hours (Competency + Time-Based Hybrid)

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## I. OCCUPATIONAL DESCRIPTION

The Qualified Energy Technician – Electrician installs, maintains, commissions, and troubleshoots electrical systems, photovoltaic (PV) systems, and energy storage systems (ESS) in residential, commercial, and utility-scale applications. Apprentices develop competencies in electrical theory, NEC compliance, safety, PV system design, ESS safety, and utility interconnection in accordance with **USDOL Registered Apprenticeship standards, NCCER curriculum frameworks, and state electrical licensing requirements.**

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## II. ON-THE-JOB LEARNING (OJL) WORK PROCESS SCHEDULE

**Total OJL Requirement:** 8,000 Hours

**Annual OJL:** 2,000 Hours

<b>Work Process</b>	<b>Approx. Hours</b>
Electrical Theory & Code Application	520
PV Systems Design & Layout	420
Installation & Construction Practices	460
Energy Storage Systems (ESS)	240

<b>Work Process</b>	<b>Approx. Hours</b>
Commissioning, Operations & Maintenance	200
Safety, Compliance & Professional Practice	160
<b>TOTAL OJL</b>	<b>2,000</b>

Apprentices shall receive **progressively increasing responsibility** and demonstrate competence in each work process area under the supervision of a qualified journey worker.

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### **III. RELATED TECHNICAL INSTRUCTION (RTI)**

**Total RTI:** 288 Hours

**Delivery Method:** Classroom, Laboratory, Design Studio, Field Simulation

**Schedule:**

- 1 Semester per year
- 12 Instructional Weeks per year
- 6 Hours each Week

RTI is aligned to **NCCER Electrical Levels 1–4, NABCEP task analysis, and NEC Articles 90–110, 250, 690, 705, 706, NFPA 855, and UL standards.**

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### **IV. RTI COURSE SEQUENCE (SEMESTER-BASED)**

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**SEMESTER 1 (Level 1 Apprentice) (3 scheduled per year Jan, May, Sept.)**

**AST-101: Electrical Fundamentals & NEC Foundations**

**RTI Hours:** 72

**Prerequisite:** Apprentice Enrollment

**Course Scope:**

Foundational electrical theory, safety, and NEC navigation for energy and electrical technicians.

**Core Competencies:**

- Electrical theory (AC/DC)
- Electrical math and calculations
- NEC structure and interpretation

- Grounding and bonding fundamentals
- Electrical safety and hazard recognition

**Aligned NCCER Modules:**

- Electrical Safety
- Electrical Theory
- Conduit Basics
- Introduction to the NEC

**Assessment Methods:**

Written exams, lab practicals, NEC navigation exercises

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**SEMESTER 2 (Level 2 Apprentice) (3 scheduled per year Jan, May, Sept.)**

**AST-201: Photovoltaic Systems & NEC Article 690**

**RTI Hours:** 72

**Prerequisite:** AST-101

**Course Scope:**

PV system components, design methodology, and NEC 690 compliance for residential and commercial systems.

**Core Competencies:**

- PV module and inverter technologies
- String sizing and temperature calculations
- DC/AC ratios
- Rapid shutdown compliance
- Single-line diagram development

**Aligned NCCER / Industry Standards:**

- NCCER Solar Photovoltaic Systems
- NEC Article 690
- NABCEP PV Installation Professional Domains

**Assessment Methods:**

Design projects, code compliance exercises, midterm and final exams

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## **SEMESTER 3 (Level 3 Apprentice) (3 scheduled per year Jan, May, Sept.)**

### **AST-301: Advanced PV, Utility Interconnection & Energy Storage Systems**

**RTI Hours:** 72

**Prerequisite:** AST-201

**Course Scope:**

Commercial/utility-scale PV systems, ESS integration, and utility interconnection.

**Core Competencies:**

- NEC Article 705 (Interconnected Systems)
- Load-side and supply-side connections
- CTs, meters, and utility requirements
- ESS architectures and chemistries
- ESS fire safety and emergency response

**Standards Alignment:**

- NEC Articles 705 & 706
- NFPA 855
- UL 1973, UL 9540, UL 9540A

**Assessment Methods:**

Lab practical's, code application exams, ESS safety evaluations

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## **SEMESTER 4 (Level 4 Apprentice) (3 scheduled per year Jan, May, Sept.)**

### **AST-401: Commissioning, O&M, Safety & Exam Preparation**

**RTI Hours:** 72

**Prerequisite:** AST-301

**Course Scope:**

System commissioning, troubleshooting, maintenance, and professional readiness.

**Core Competencies:**

- Commissioning procedures
- Electrical testing and verification
- Fault diagnosis
- Preventive maintenance
- OSHA and NFPA compliance

- Licensing and certification exam preparation

**Standards Alignment:**

- OSHA-10 Construction
- NFPA 70 & 70E
- NABCEP & State Licensing Blueprints

**Assessment Methods:**

Capstone project, practical exams, mock licensing examinations

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## **V. EVALUATION & COMPLETION REQUIREMENTS**

To successfully complete the apprenticeship, the apprentice must:

- Complete **8,000 hours of supervised OJL**
  - Complete all **RTI coursework**
  - Demonstrate competency in all work processes
  - Maintain satisfactory academic and safety performance
  - Meet employer and sponsor performance standards
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## **VI. CREDENTIALS AWARDED**

Upon successful completion, apprentices may earn:

- **USDOL Certificate of Completion of Apprenticeship**
- **NCCER Transcript & Credentials** (as applicable)
- **Eligibility to sit for State Electrical Licensing Exam**
- **Preparation for NABCEP PV Certifications**