



Apprenticeship Arizona



Appendix A

WORK PROCESS SCHEDULE

AND

RELATED INSTRUCTION OUTLINE
for

ELECTRICIAN

Appendix A

WORK PROCESS SCHEDULE

OCCUPATION TITLE: Electrician

O*NET-SOC CODE: 47-2111.00 RAPIDS CODE: 0159

This schedule is attached to and a part of these Standards for the above identified occupation.

1. TYPE OF OCCUPATION

X Time-based

Competency-based

Hybrid

2. TERM OF APPRENTICESHIP

The term of the occupation is 4 to 5 years with an OJL attainment of 8000 hours, supplemented by the minimum required 576 hours of related instruction.

3. RATIO OF APPRENTICES TO JOURNEY WORKERS

The Apprentice to Journey Worker ratio is: one (1) Apprentice to the one (1) Journey Worker and one (1) additional apprentice for each one (1) Journey Workers normally employed at the trade.

4. APPRENTICE WAGE SCHEDULE

Apprentices shall be paid a progressively increasing schedule of wages based on either a percentage or a dollar amount of the current hourly journey worker wage rate, which is on file with the registration agency.

4-Year Term Example:

1 st	1000 hours = 65%	2 nd	1000 hours = 67.5%
3 rd	1000 hours = 70%	4 th	1000 hours = 73.75%
5 th	1000 hours = 77.5%	6 th	1000 hours = 82.5%
7 th	1000 hours = 88.75%	8 th	1000 hours = 95%

5. WORK PROCESS SCHEDULE (See attached Work Process Schedule)

The sponsor may modify the work processes to meet local needs prior to submitting these Standards to the appropriate Registration Agency for approval.

4. WORK PROCESS SCHEDULE

The apprentice will receive instruction and experience in all processes of the occupation in accordance with the following on-the-job training schedule:

APPRENTICE SHALL RECEIVE APPROXIMATELY

<u>PROCESS:</u>	<u>HOURS</u>
A. Residential Wiring	1000
B. Underground	1000
C. Branch Conduit	1000
D. Branch Wiring	1000
E. Lighting	1000
F. Control Systems	800
G. Grounding Systems	400
H. Distribution	1000
I. Special Systems	800
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TOTAL HOURS	8,000

The above schedule is recognized as sufficiently flexible to be changed if accumulated experience indicates that changes will be to the advantage of the Sponsor and the Apprentice.

Appendix A
Related Training Instruction Outline

Occupation Title Electrician

O*NET-SOC CODE: 47-2111.00 RAPIDS CODE: 0159

SCHEDULE SCHEDULE OF RELATED INSTRUCTION

In accordance with these registered program standards, each apprentice shall participate in related theoretical training, for a minimum of 144 hours, in the areas and subjects identified below:

SUBJECT/COURSES/CLASSES

First Year:

- 101** Orientation, Electricity Principles
- 102** Hand Tools, Blueprint Processes, Safety, Assessment Inventories
- 103** First Aid/CPR/AED
- 104** First Aid/CPR/AED
- 105** Math Principles
- 106** Electrical Symbols and Outlets, Circuit Theory
- 107** Lighting and Appliance Circuits
- 108** Conductors, Wiring, and Basic Circuits
- 109** Switch Control, Receptacle Bonding, and Ohm's Law
- 110** **Mid-Term Exam**
- 111** Ground Fault Protection
- 112** Luminaries (Fixtures)
- 113** Bedroom Lighting and Series Circuits
- 114** Lighting Bathrooms and Hallways, Basic Measurement Lab
- 115** Entryway Wiring, Math Review
- 116** Kitchen Circuits, Series Circuits Lab
- 117** Review First Semester
- 118** **First Semester Final Exam**
- 119** Living Room/Study Lighting, Residential Circuit Switches and Controls
- 120** Laundry Outlets, Residential Multiple Lamp Circuits and Receptacles
- 121** Garage Circuits, Parallel Circuit Calcs.
- 122** Rec. Rooms, Workshops, and Circuit Efficiency
- 123** Water Pumps and Heaters, and Power Sources, Parallel Circuits Lab
- 124** Kitchen Outlets, Series and Parallel Circuits
- 125** Special Purpose Outlets
- 126** Heating Systems
- 127** **Mid-Term Exam**
- 128** Television, Telephone, and Low Voltage Systems

- 129 Lamp Identification, Low Voltage Lighting
- 130 Fire Alarm and Security Systems
- 131 Knots and Rigging
- 132 Conduit Bending
- 133 Service Equipment
- 134 Swimming Pools, Spas, and Hot Tubs
- 135 Review First Year
- 136 **First Year Final Exam**

Second Year:

- 201 Orientation Safety and Math Review
- 202 Advanced Math and Hazcom
- 203 Measuring Instruments
- 204 Introduction to Alternating Current
- 205 Resistance, Inductance, and Capacitance
- 206 Inductors and Capacitors in Series, Power Factor, Blueprint Reading
- 207 Inductors and Capacitors in Parallel, Blueprint Reading
- 208 Series/Parallel Inductors and Capacitors, Blueprint Reading
- 209 **Mid-Term Review and Exam**
- 210 Single Phase Transformers
- 211 Single Phase Transformer Lab
- 212 Three Phase Transformers
- 213 Three Phase Transformer Lab
- 214 Installing Transformers, Transformer Vaults
- 215 Transformer Sizing and Protection
- 216 Secondary Ties, Transformer Windings, and Components
- 217 First Semester Review
- 218 **First Semester Final Exam**
- 219 Circuit Requirements and Alternative Power Sources
- 220 Motors
- 221 Single Phase Motors
- 222 Three Phase Motors
- 223 DC Motors
- 224 Sizing and Protecting Motors and Motor Circuit Conductors
- 225 Motor Lab
- 226 Troubleshooting Motor Windings and Components, Control Circuit Conductors and Components; Compressor Motors
- 227 **Mid-Term Review and Exam**
- 228 General Wiring, Conduit and Box Sizing
- 229 Outlets, Lighting, Appliances and Heating
- 230 Services and Feeder Calculations
- 231 Grounding, Bonding and Over-current Protection
- 232 Hazardous Locations and Motor Circuit Winding
- 233 Health Care Facilities and Emergency Systems

- 234 Industrial and Commercial Wiring, Special Applications Wiring
- 235 Second Semester Review
- 236 **Second Semester Final Exam**

Third Year:

- 301 Registration & Orientation
- 302 First Aid/CPR Review
- 303 Construction Documents and Blueprint Reading Fundamentals
- 304 Survey and Site Plans
- 305 Structural, Architectural, and Mechanical Blueprints
- 306 Electrical Branch Circuits, Feeders, and Lighting Blueprints
- 307 Electrical Services and Service Entrance on Blueprint
- 308 Specialty System Blueprint Reading
- 309 **Review & Midterm Exam**
- 310 Data, Voice, and Video Cabling using Copper Wiring
- 311 Fiber Optics and Fiber Optic systems
- 312 3-Phase Systems and Transformer Review/Harmonics
- 313 Introduction to Grounding
- 314 Conductors Used for Grounding, Bonding, and Systems
- 315 Equipment Bonding and Ground Fault Protection
- 316 Separately Derived Systems, Multiple Building Grounding, and Fault Current Calculations
- 317 Grounding Review, Semester Review
- 318 **Semester Final**
- 319 Electrical Quantities and Circuits
- 320 Electrical Tools and Test Instruments/Safety
- 321 Symbols, Logic and Line Diagrams
- 322 Solenoids
- 323 Contactors and Motor Starters
- 324 Control Devices
- 325 Motor Control Lab #1
- 326 Motor Control Lab #2
- 327 Reversing Circuits
- 328 **Review and Mid-Term Exam**
- 329 Time Delay and Counters
- 330 Motor Control Lab #3
- 331 Introduction to Fire protection Signaling Systems – Conventional Systems
- 332 Fire Alarm Systems Lab #1
- 333 Installation, Start-up, maintenance, and Troubleshooting Of Fire Alarm Systems, and New Technology Systems
- 334 Fire Alarm Systems Lab #2

- 335 Second Semester Review
- 336 **Third Year Exam**

Fourth Year:

- 401 Using Digital Multimeters to Diagnose Power Quality
- 402 Community First Aid & Safety
- 403 Solid State Electronic Control Devices
- 404 Electromechanical and Solid-State Relays
- 405 Advanced Controls Lab #1
- 406 Photoelectric and Proximity Controls
- 407 Programmable Controllers
- 408 Advanced Controls Lab #2
- 409 **Mid-Term Review and Exam**
- 410 Reduced Voltage Starting
- 411 Accelerating and Decelerating Methods
- 412 Advanced Controls Lab #3
- 413 Preventative Maintenance and Troubleshooting
- 414 Advanced Controls Lab #4
- 415 Leadership
- 416 Semester Review
- 417 **Semester Exam**
- 418 Using Digital Multimeters to Diagnose Power Quality
- 419 National Electrical Code and Related Standards, Safety Regulation, Power Systems
- 420 Power Distribution Systems
- 421 Services, Switchboards, and Panel-boards
- 422 Conductors and Over-current Protection Devices
- 423 Lightning Protection and Grounding
- 424 Designing and Installing Wiring Systems
- 425 Branch and Feeder Circuits
- 426 **Mid-Term Review and Exam**
- 427 Receptacle and Lighting and Switching Outlets
- 428 Motors and Compressor Motors
- 429 Hazardous Locations
- 430 Hazardous Locations, Special Types
- 431 Signs and Sign Connections
- 432 Load Calculations
- 433 Final Code Review and Test Preparation
- 434 Fourth Year Review
- 435 **Fourth Year Final Exam**