

## POWER SUPPLY SYSTEMS

**UNIT CODE:** ENG/CU/ET/CR/02/6/A

### **Relationship to Occupational Standards**

This unit addresses the unit of competency: Install power supply systems

**Duration of Unit:** 200 hours

### **Unit Description**

This unit covers competencies required for installing power supply system. Competencies includes; identifying power supply system components, designing power supply system, assembling tools, equipment and materials, installing power supply system, testing power supply system and documenting power supply installation report

### **Summary of Learning Outcomes**

1. Identify power supply components
2. Designing power supply system
3. Assemble tools, equipment and materials
4. Install power supply system
5. Test power supply system
6. Document power supply system installation report

### **Learning Outcomes, Content and Suggested Assessment Methods**

<b>Learning Outcome</b>	<b>Content</b>	<b>Suggested Assessment Methods</b>
1. Identify power supply components	<ul style="list-style-type: none"><li>• Meaning of terms</li><li>• Classification of power supply systems<ul style="list-style-type: none"><li>• Regulated power supplies</li><li>• Non-regulated power supplies</li></ul></li><li>• Components of power supply e.g.<ul style="list-style-type: none"><li>• Transformer<ul style="list-style-type: none"><li>• Step up and step down transformers</li></ul></li><li>• Single phase and three phase rectifiers<ul style="list-style-type: none"><li>• Half wave rectifiers</li><li>• Full wave rectifiers</li><li>• Full wave bridge rectifiers</li></ul></li></ul></li></ul>	<ul style="list-style-type: none"><li>• Observation</li><li>• Oral questioning</li></ul>

Learning Outcome	Content	Suggested Assessment Methods
	<ul style="list-style-type: none"> <li>• Filters               <ul style="list-style-type: none"> <li>• Shunt capacitor filters</li> <li>• Series inductor filter</li> <li>• Choke input or L-C filters</li> <li>• C-L-C or Pi filter</li> <li>• Bleeder resistor</li> </ul> </li> <li>• Voltage regulators               <ul style="list-style-type: none"> <li>• Zener diode shunt regulator</li> <li>• Transistor series voltage regulator</li> <li>• Controlled transistor series regulator</li> <li>• Transistor shunt regulator</li> <li>• Basic op-amp series and shunt regulators</li> </ul> </li> <li>• Voltage divider</li> <li>• Voltage multipliers               <ul style="list-style-type: none"> <li>• Half wave voltage doubler</li> <li>• Full wave voltage doubler</li> <li>• Voltage tripler</li> <li>• Voltage quadrupler</li> </ul> </li> <li>• DC power converters               <ul style="list-style-type: none"> <li>• DC choppers</li> <li>• Boost converters</li> <li>• Buck-boost converters</li> <li>• Cyclo-converters</li> </ul> </li> <li>• Protection components of a supply system               <ul style="list-style-type: none"> <li>• Fuses                   <ul style="list-style-type: none"> <li>• Types of fuses</li> </ul> </li> <li>• Varistor</li> <li>• Overload relays                   <ul style="list-style-type: none"> <li>• Types of overload relays</li> </ul> </li> <li>• Step down transformers</li> <li>• Circuit breakers                   <ul style="list-style-type: none"> <li>• Types of circuit breakers</li> </ul> </li> </ul> </li> </ul>	

Learning Outcome	Content	Suggested Assessment Methods
2. Design power supply system	<ul style="list-style-type: none"> <li>• Meaning of terms</li> <li>• Factors to consider when designing power supply system.               <ul style="list-style-type: none"> <li>• Load size</li> <li>• Type of supply and load</li> <li>• Nature of the load requirements</li> </ul> </li> <li>• Calculations involved in power supply system design               <ul style="list-style-type: none"> <li>• Rectifiers</li> <li>• Filters</li> <li>• Converters</li> <li>• Regulators</li> <li>• System efficiency</li> </ul> </li> <li>• Interruptible and Uninterruptible power supply system</li> <li>• Maintenance of power supply system</li> <li>• IEE regulations</li> </ul>	<ul style="list-style-type: none"> <li>• Observation</li> <li>• Oral questioning</li> <li>• Written tests</li> <li>• Practical tests</li> </ul>
3. Assemble tools, equipment and materials	<ul style="list-style-type: none"> <li>• Meaning of terms</li> <li>• Classification of tools used in power supply system installation e.g.               <ul style="list-style-type: none"> <li>• Analogue and digital instruments</li> <li>• Indicating tools and equipment</li> <li>• Measurement tools and equipment</li> <li>• Cutting tools and equipment</li> <li>• Tightening tools</li> </ul> </li> <li>• Materials used in power supply installation e.g.               <ul style="list-style-type: none"> <li>• Cables</li> <li>• PCBs                   <ul style="list-style-type: none"> <li>• Types of PCBs                       <ul style="list-style-type: none"> <li>• Single layer PCB</li> <li>• Double layer PCB</li> <li>• Multilayer PCB</li> <li>• Rigid PCB</li> <li>• Flexible PCB</li> </ul> </li> </ul> </li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Written tests</li> <li>• Oral questioning</li> <li>• Practical tests</li> </ul>

Learning Outcome	Content	Suggested Assessment Methods
4. Install power supply system	<ul style="list-style-type: none"> <li>• Interpretation of power supply system design               <ul style="list-style-type: none"> <li>• Circuit diagram</li> </ul> </li> <li>• Factors to consider in installation of power supply systems</li> <li>• Power supply component fixing techniques e.g.               <ul style="list-style-type: none"> <li>• Arduino and Atmega</li> <li>• Breadboard connections</li> <li>• Process etching</li> </ul> </li> <li>• Power supply system protection               <ul style="list-style-type: none"> <li>• Earthing</li> <li>• Grounding</li> <li>• Enclosures                   <ul style="list-style-type: none"> <li>• Ingress protection classes</li> </ul> </li> </ul> </li> <li>• Waste disposal</li> <li>• IEE regulations</li> <li>• NEMA regulations</li> </ul>	<ul style="list-style-type: none"> <li>• Observation</li> <li>• Oral questioning</li> <li>• Practical tests</li> <li>• Written tests</li> </ul>
5. Test power supply system	<ul style="list-style-type: none"> <li>• Meaning of terms</li> <li>• Test tools and instruments</li> <li>• Types of tests on power supply system e.g.               <ul style="list-style-type: none"> <li>• Test for AC input supply</li> <li>• Test for output from rectifiers</li> <li>• Test for waveform and output voltage from filters</li> <li>• Short circuit tests</li> <li>• Open circuit tests</li> </ul> </li> <li>• Safety during testing of power supply system</li> <li>• IEE regulation</li> </ul>	<ul style="list-style-type: none"> <li>• Observation</li> <li>• Oral questioning</li> <li>• Practical tests</li> <li>• Written tests</li> </ul>
6. Document power supply system installation report	<ul style="list-style-type: none"> <li>• Meaning of terms</li> <li>• Installation report preparation eg               <ul style="list-style-type: none"> <li>• Circuit diagrams</li> <li>• Flow chart</li> <li>• Block diagram</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>•</li> </ul>

Learning Outcome	Content	Suggested Assessment Methods
	<ul style="list-style-type: none"> <li>• Written report</li> <li>• Documentation and sharing or installation report</li> </ul>	

### **Suggested Methods of Instruction**

- Demonstration by trainer
- Practice by the trainee
- Field trips
- Discussions

### **Recommended Resources**

#### **Installation instruments**

- Continuity tester (ohmmeter)
- Insulation resistance tester
- Earth loop impedance tester
- Test lamp
- CRO
- Multimeter
- Computer

#### **Materials and supplies**

- Stationery
- Test Certificate
- PCB
- Design softwares

#### **Reference materials**

- Manufacturers' manuals
- Relevant catalogues
- IEE regulations
- OSHA regulations