



Course: **Certificate in Electricity & Electronics**

Guided Learning Hours: **24 hours**

Pre-requisite: **Basic Mathematics and Science**

Abstract

This unit provides an overview of the fundamental technical knowledge of electricity and electronics and provides a basis for further study. Concepts of electric current flow, circuit calculations, alternating current versus direct current theories, transformers and semi-conductor design and use are emphasized throughout this course. Learning will take place through a combination of lectures and laboratory sessions.

Target Audience

This course is ideally suited for anyone who wants to understand what electronics is all about and to develop the basic skills and knowledge to apply to troubleshooting electronic systems.

Learning outcomes

On completion of this course, learners will be able to:

1. Understand the concept of Electricity and identify the various effects of electric current flow. To also differentiate between the various quantities involved with an electric current flow in a circuit.
2. Perform simple circuit calculations involving ohm's law in series and parallel resistive circuits. To also understand the operation of resistors, capacitors and Inductors in electrical and electronic circuits.
3. Understand the difference between alternating current and direct current in a circuit. To also understand the principle of operation of a transformer including various types and applications.
4. Understand semiconductors and various semiconducting components such as diodes and transistors and Integrated Circuits.

Course Content

1. Introduction to Electricity and the Electric circuit

Atomic structure of materials: covalent bonding; free electrons; conductors, insulators; semiconductors

Effects of an electric current: chemical; magnetic; heating; lighting

Electric current flow: concept of electron flow; voltage; current; resistance

2. Simple circuit calculations; Resistance, Capacitance, Inductance

Equivalent resistance & Ohms law: Series; parallel; series/parallel

Resistor color coding: Ohmic value; tolerance factor; stability

Capacitors: Series and parallel calculations; dielectrics; charge; types

Inductors: Self-inductance; series and parallel calculations; types

3. Alternating Current vs. Direct Current and the Transformer

A.C and D.C Waveforms: Types; source; properties; typical values

Three phase loads: Types; applications; line and phase values; formulae; diagrams; typical voltages

Transformer: principle of operation; types; applications; losses; turns ratio; calculation

4. Semiconductors: Diodes, Transistors, Integrated Circuits

Silicon semiconductor: P type; N type; atomic characteristics; doping; impurities

Diodes & Transistors: Types; biasing; applications; characteristics

Rectifier circuits: half wave; full wave; full wave bridge; filtering

Integrated Circuits: Concept; analog vs. digital; applications; characteristics

Assessment Criteria

| In order to achieve Learning Outcome... | The Learner must... |
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| 1. Introduction to Electricity and the Electric Circuit | 1.1 Understand the concept of an electric current and identify various types of electrical materials. 1.2 Identify the effects of an electric current and define the quantities associated with an electric current in a circuit. 1.3 Identify formulas associated with various electrical quantities and use test instruments to identify various quantities in a circuit. |
| 2. Simple circuit calculations; Resistance, Capacitance, Inductance. | 4.1 Identify various types of resistive electrical circuits; perform calculations for equivalent resistance and ohm's law in various types of circuits. 4.2 Identify color coding of fixed resistors and measure equivalent resistances. 4.3 Identify various types of electronic components. 4.4 Define Resistance, Capacitance and Inductance; identify formulas associated with these quantities and perform calculations in series and parallel circuits. |
| 3. Alternating Current verses Direct Current and the Transformer. | 4.1 Differentiate between A.C and D.C, giving practical applications of each type of supply and Identify values associated with alternating waveforms. 4.2 Identify star and delta connected three phase loads. 4.3 Identify the principle of operation of a transformer. 4.4 Perform calculations (basic) associated with the transformer. |

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| 4 Semiconductors: Diodes, Transistors and Integrated Circuits. | 4.1 Understand P type and N type semi-conducting materials and explain the operation of various types of diodes. 4.2 Identify various types of rectifier circuits. 4.3 Identify various types of transistors, state practical applications. 4.4 Understand the concept of an Integrated circuit and identify various types of IC's (analog and digital). |
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Essential Learning Resources:

Learners will need access to a range of various websites relating to electrical and electronics. These may include: publications, data sheets and supporting videos. These additional resources would be directed during the delivery of this course.

Textbooks and Manuals

1. Success in Electronics (Tom Duncan)
2. Electrical Installation theory and practice (E.L Donnelly)
3. Cadet student manual