



In association with  
Techno training

# INDUSTRIAL ELECTRICAL SYSTEMS

"5 day level 6 QQI course"



at the W8 Centre

Manorhamilton

August 2nd, 3rd, 4th, 9th, 10th

# INDUSTRIAL ELECTRICAL SYSTEMS

## OVERVIEW

The Industrial Electrical Systems course offered by TECHNOTRAINING leads to the QQI Level 6 6N5377 Minor award. It is one of eight modules needed to complete the 6M5154 Maintenance Skills Technology major award.

## Programme Description

The course develops the skills required by industrial maintenance technicians to safely diagnose and repair faults in electrically controlled production equipment. Learners must first understand the correct operation of electric circuits and electrical components and then by navigating schematics, using good logical thinking and skillful test strategies, they will be able to narrow to the root cause. It enables maintenance staff to be effective in the use of preventative and corrective maintenance and service strategies when working on modern production systems and components. We offer a uniquely practical course focused on replicating real-life production issues to create optimum skills transfer to job performance. We can customize this course for clients incorporating application-specific drawings.



# INDUSTRIAL ELECTRICAL SYSTEMS

## Who Should Attend?

The course is ideally suited to industrial maintenance personnel who would like to increase their electrical troubleshooting skills. The course is for anyone who has a need to work with electrical systems in their workplace. It is geared towards non-electrical staff to enable them to carry out repairs and replacements safely, but electrically trained personnel will also find opportunities to add to their troubleshooting skills. Correct diagnosis of electrical systems faults saves time and money in the long run. Effective troubleshooters add great value to the organization they work for. Learning to work safely with electrical equipment is central to the course and qualification means that you have demonstrated your competence as required by Health and Safety legislation. This internationally recognized qualification will present opportunities to work in diverse areas within the manufacturing environment carrying out the diagnosing and repair/replacement of components.

## Learner Profile

A learner seeking entry to this Level 6 program does not need a previous formal qualification but should have relevant work or life experience to have reached the standards of knowledge, skill, and competence associated with Level 5 of the National Framework of Qualifications. Learners would typically be working in a manufacturing environment and are members of the equipment maintenance team. Learners must have some experience working with electrical components and they should be familiar with using a multimeter to troubleshoot, in order to complete the course in 5 days.

Competence in written and spoken English is essential. International students whose first language is not English are required to have an appropriate score in an approved examination in the English language. We accept an IELTS test score of 6. We also accept IELTS equivalents such as TOELF score 60-78 and Cambridge exam level B2.

# INDUSTRIAL ELECTRICAL SYSTEMS

## Objectives

- Test electrical systems to narrow down a problem area.
- List electrical hazards when testing live systems and list ways to minimize hazards.
- Use electrical schematics to navigate a system effectively.
- Set up and troubleshoot a range of automation sensors.
- Carry out LOTO procedures correctly.
- Describe the operating principle of fuses, MCBs, and RCDs.
- Competently use multi-meters and grip-on to test systems .
- Test 3-phase motor circuits controlled by contactors and overloads.
- Demonstrate how to troubleshoot a range of common faults on work-based technology.
- Test and fault find electrical actuators including 3-phase motors, solenoids, and coils, DC motors.



# INDUSTRIAL ELECTRICAL SYSTEMS

## Course Modules

### Unit 1

Electrical Concepts: at the end of this learners should be able to:

- Describe Current, Voltage and Resistance.
- Build series and parallel circuits.
- Measure currents and voltages.
- Explain how Ohms Law works in Parallel and in Series Circuits.

### Unit 2

Electrical Safety Awareness: at the end of this learners should be able to:

- List the hazards associated with electricity.
- Appreciate why precautions are necessary.
- List the effects of electricity on the human body.
- Evaluate if it is necessary to work LIVE.
- List the types of electrical fault and circuit protection.
- Appreciate why and when LOTO is required.
- Follow procedures for working on equipment LIVE and De-energised.

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## Course Modules

### Unit 3

Circuits and Circuits Components – at the end of this learners should be able to:

- Understand the differences between conductors and insulators.
- Understand the concept and units of voltage, current and resistance. Use Ohm's law to predict circuit behaviour.
- Competently use a multimeter to measure V, I and R.
- Understand Kirchoff's current law.
- Work out what voltages and currents will be at different points in series and parallel circuits.
- Understand how to detect and conclude that circuits have open or short circuit faults.
- Use the correct specification language to describe switchgear in terms of poles and throws (ways).
- Understand the principles of electro-magnetism and how it applies to DC motors.

### Unit 4

Electrical Protection - at the end of this learners should be able to:

- List the types of fault conditions that can be detected and protected.
- Describe the principle of operation of circuit breakers.
- Choose correct MCB rating and trip characteristics for given application.
- Explain Fuse types, ratings and application examples.
- List a set of scenarios that could cause the activation of RCD's and RCBO's.
- Troubleshoot to find the cause of a tripping RCD in a typical distribution board.

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## Course Modules

### Unit 5

AC Systems - at the end of this learners should be able to:

- Describe the characteristics of an AC Sine Wave in terms of RMS voltage, peak voltage, frequency, and time period.
- Deduce Inductive Reactance in an AC coil.
- Understand transformers, split coils, turns, step-up and step-down.
- Use DC to switch AC circuits.

### Unit 6

3-phase and motor control circuits- at the end of this learners should be able to:

- Describe how 3-phase power is generated and distributed.
- Explain the principle of induction motors including motor poles and rpm, star/delta wiring setups, Power, and Torque ratings.
- Take resistance reading to deduce condition of coils.
- Wire 3ph motor control and protection using contactors and overloads.
- Cause single phasing to occur to see motor response.
- Control motors using a variable speed drive.
- Troubleshoot forward and reverse 3-phase motor circuits.

### Unit 7

Reading Electrical Schematics - at the end of this learners should be able to:

- Use schematics to see how power is distributed from 3ph to 1ph to DC to safety circuits.
- Interpret symbols and skilfully navigate your way on both US and EU drawings.
- Understand how to use electrical schematics to effectively troubleshoot.

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## Course Delivery

- There are 5 instructor led days with self-directed hours of between 20 and 100 hours, depending on entry level knowledge.
- Learners are required to bring a laptop/tablet to the classroom on each of the course scheduled days. The course cannot be completed on a phone.
- Self-directed hours take the form of interactive activities on our LMS platform. There is plenty of scope and opportunity there for learners to revise key concepts and prepare for exams.
- Course days are generally scheduled over 3 weeks to facilitate time for self-directed hours of learning at home.
- The online course resources needed for self-directed hours are available as soon as learners register on the course.
- Class size is limited to 10 people maximum to enable individual attention and the pace to be adjusted to learner needs.
- We provide custom built desktop training kits, 1 per person. Kits include electrical components, fuses, power supplies, switches, reed switches, sensors, solenoids, transformers, relays, contactors with embedded hidden faults.
- Workbooks are provided for practical exercises and revision.
- Troubleshooting simulation software for additional practice and interactive learning is incorporated into the course.
- Learners taking QQI accredited courses who successfully complete all their assessments during the course will receive their QQI certificates within 3 months of taking the course



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## Programme Assessment Plan

(Pass mark is 50%)

Programme Title	% of Total Mark	Time/Day of Assessment	Assessment Duration
<b>QQI Level 6 Industrial Electrical Systems</b>			
<b>Exam 1</b> 19 questions. All questions must be attempted. 50 % Pass required in this exam	30%	Morning Day 3	50 mins
<b>Exam 2</b> 40% threshold must be reached 24 questions. All questions must be attempted.	40%	Morning Day 5	1 hour & 30 mins
<b>Skills Demonstration 40% threshold must be reached</b> Task 1: 7 questions. Learners are asked to use electrical schematics provided to answer questions. Task 2: 4 questions. Learners use the training kits and schematics provided to demonstrate wiring and fault-finding skills	10%	Late Morning Day 5	45 mins
	20%	Afternoon Day 5	1 hour

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