

# COURSE DESCRIPTION

**Safety**

## Topical Outline

- EU & Directives
- CE Marking
- Acquisition and the Safe Use of Machinery (PUWER98)
- Harmonised Standards
- Hazards & Risks
- Risk Assessments
- Risk Reduction
- Guarding and Protective Devices
- Safety Related Parts of Control Systems
- Safe design of Control Panels
- Safety of Integrated Manufacturing Systems

## Student Materials

To enhance and facilitate your learning experience, the following materials are provided as part of the course package:

- Student Manual, which contains the topical outlines.

## Certification

A City and Guilds exam will be taken upon completion of the course. Delegates who pass the exam will receive a City and Guilds Certificate... The minimum pass mark required is 80%.

**Duration** 4 Days

**Course Number** GBR8608

**Course Costs** £ 1,100.00  
€ 1,290.00

## Course Dates

- 14<sup>th</sup> March 2011
- 11<sup>th</sup> April 2011
- 25<sup>th</sup> July 2011
- 19 September 2011
- 14<sup>th</sup> November 2011

## City and Guilds - Introduction to Machinery Safety



## COURSE NUMBER: GBR8608

### Course Purpose

The purpose of this comprehensive course is twofold:-

- to give designers of machinery the knowledge and tools to design safe machinery in accordance with European Union Machinery, and associated Directives, and to declare compliance by CE Marking.
- to give owners, users and maintainers of machinery the knowledge and tools to acquire, place into service and maintain safe machinery in accordance with the Provision and Use of Work Equipment Regulations 1998 (PUWER98).

### Who Should Attend

This course should be attended by designers, engineers & managers. It is designed for both suppliers and users of machinery in order that they are aware of the legal requirements as defined by the European Union Machinery, and associated Directives together with UK Regulations including CE Marking and PUWER98. The outcomes are that they are able to competently employ appropriate technical solutions and legally apply the EU CE Mark and undertake a PUWER98 audit.

### Prerequisites

To successfully complete this course, the following prerequisites are required:

- General experience with industrial machinery
- Practical experience of a operating manufacturing environment

**City & Guilds**

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### Power, Control and Information Solutions

Americas: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444

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## Topical Outline

### Unit 1 – Europe & Directives

#### Objective:-

To develop an awareness of the aims of the European Union and their implementation using European Directives.  
To introduce the Directives that call for CE Marking and to examine the essential requirements of the Machinery Directive, the Use of Work Equipment Directive and the associated directives that may be applied in the machinery industry.

#### Key Topics:-

- Single European Market
- European Directives & their adoption into UK Law
- New Approach Directives, Essential Requirements & the CE Mark
- CE Marking Directives
- Machinery Directive, its Essential Requirements & the implications of Annex IV
- Use of Work Equipment Directive
- Associated Directives:-
  - Low Voltage Directive & its Essential Requirements
  - EMC Directive & its Essential Requirements
  - Pressure Equipment Directive & its Essential Requirements
  - ATEX Directives & their Essential Requirements

### Unit 2 – CE Marking

#### Objective:-

To develop an understanding of the purpose of CE Marking and what manufactures and importers of machinery and associated equipment must do to comply and be able to apply the mark.

#### Key Topics:-

- Purpose of the CE Mark
- How do manufactures and importers of machinery comply?
- What the CE Mark indicates
- Compiling a Technical Construction File
- Preparing a Declaration of Conformity or Incorporation
- Applying the CE Mark
- The difference between CE Marking & PUWER98
- Enforcement

### Unit 3 – Buying & Using Machinery – the CE Mark & PUWER98

#### Objective:-

To understand the implications of importing machinery from outside the EU.  
What information manufactures must provide when purchasing machinery and when to expect a CE Mark.  
To understand the obligations under the Provision & Use of Work Equipment Regulations (PUWER98) and who is responsible.  
Methods of undertaking a PUWER98 “audit” and how PUWER98 is enforced.

#### Key Topics:-

- Purchase of machinery from outside the EU
- Who is responsible for what?
- Buying a new machine & protecting investment.
- Purpose of PUWER98?
- The difference between CE Marking & PUWER98
- What is a PUWER Audit and when and how often should it be undertaken?
- Enforcement

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## Unit 4 – European Harmonised Standards

### Objective:-

To develop an understanding of standards and indicate the relationship between UK, European and International standards. To examine the purpose of European Harmonised Standards, their development and relationship with Directives CE Marking & PUWER98. To introduce the core “Safety of Machinery” standards and new standards being introduced in support of so called “Functional Safety”.

### Key Topics:-

- What is a Standard?
- UK, EU & International Standards
- What is a Harmonised Standard?
- Structure of a Harmonised Standard
- Safety of Machinery Standards – A, B & C type standard relationships
- An overview of the Safety of Machinery “core” standards
- “Functional Safety” – the relevance of EN 61508, EN 62061 & EN ISO 13849

## Unit 5 – Hazards and risks

### Objective:-

To help maintain a “focus” on the need for safety of industrial machinery by over viewing real accidents, incidents and risks which could lead to serious injury.

To indicate the powers of the authorities, actual penalties applied and the consequences to business.

### Key Topics:-

- Analysis of accidents involving equipment and machines.
- Powers of the regulatory authorities and the Courts
- Evaluate the cost implications of making equipment compliant.
- Evaluate the moral, cost, business & custodial implications of non-complaints.

## Unit 6 – Risks Assessment

### Objective:-

To examine the relationship between hazards and risks and to remove the “mystique” associated with Risk Assessment. To explore types of risk associated with machinery and their application environment and how control over the risks may be applied. Examination of qualitative and quantitative method of risk assessment and how they are most suitably applied.

### Key Topics:-

- What is Risk Assessment?
- Risk Assessment as a problem solving “Tool”
- Definitions of Hazard & Risk
- Types of risk
- Risk Control - Hazard identification, Risk Evaluation & Management
- Methods of Risk Assessment – Qualitative vs Quantitative
- What is “suitable & sufficient”?
- Assessing the safety systems ability to resist faults (to EN954-1)
- Hints & Tips when undertaking a Risk Assessment

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## Unit 7 – Risk Reduction

### Objective:-

To develop an understanding of the methods and processes of risk reduction related to risk assessment.

To examine various hierarchical methods of risk reduction.

### Key Topics:-

- Fundamentals & objectives of Risk Reduction
- The “3 step method” of risk reduction
- What is “reasonable practicability”
- Risk reduction:-
  - by design
  - by guarding
  - by safety controls
  - by information
  - by personal protective equipment
  - by Safe Systems of Work
  - by training, supervision & organisation

## Unit 8 – Design of Safety Related Control Systems

### Objective:-

To develop a clear understanding of the purpose, requirements and realisation of the safety related parts of control systems.

To understand how to assess the required performance of a safety system in relation to the risks posed by a particular machine and to develop a suitable configuration.

To understand how a complete safety system should encompass the electrical, pneumatic, hydraulic and mechanical parts of the control system.

To study the application of electronic and programmable equipment in safety applications.

To examine so called “Functional Safety” systems.

To become familiar with the available safeguards & protective devices and their appropriate application.

To be able to control and manage the design and application of safety related control systems.

### Key Topics:-

- The safety systems concept
- Resistance to Faults (EN954-1) - Redundancy & Diagnostics
- Configuration of a safe related control system
- The “Safety Relay” – a magic box?
- Designing safety related control systems – electrical, pneumatic & hydraulic
- Electronic & Programmable Logic in safety related systems
- What is “Functional Safety”?
- Types of “Functional Safety” systems – configurable & programmable
- Selection & application of safeguards & protective devices
- Actuator & motor control and “Safe Off” functions
- Emergency Stops
- Zoning of Danger Areas & hazards
- Managing the design of safety related control systems
- Documentation & Information for use
- Managing the modifications to a safety related control system

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## Unit 9 – Verification & Validation of Safety Related Control Systems

### Objective:-

To develop the objectives of Unit 6 by considering other factors associated with the design of a safety system including reliability, environment and use.

To understand the need for quantified verification and validation of safety related control systems and the changes taking place in connection with so called “Functional Safety”.

To identify & understand the “new” terminology including SIL, PL, CCF, etc.

To be able to determine a required level of performance and quantify the anticipated performance of a safety related system using practical values and techniques.

### Key Topics:-

- Functional Safety - Considerations, Design, Verification & Validation
- Implications & relevance of EN 61508, EN 62061 & EN ISO 13849.
- What is SIL & Performance Level?
- Estimating the systems required performance
- Simplifying quantified verification of complete safety related control systems:-
  - Quantifying component & system reliability
  - Creating an Architecture
  - System Diagnostics
  - Other considerations – Common Mode Faults, Environment, Use
- Estimating actual performance against required performance of the system
- Integrating Safety related Firmware into software configurations
- Validation of the safety related control system
- Documentation

## Unit 10 – Design of Control Panels

### Objective:-

To understand the requirements of ISO 13849 and good practice in the design of control panels for machinery.

### Key Topics:-

- General considerations and ISO 13849
- Protection
- Control circuits & functions
- Safety & Emergency Controls
- Operator interfaces
- Electronic equipment
- Switchgear
- Wiring
- Accessories & Lighting
- Dealing with EMC
- Labelling & Marking
- Documentation & Information for use
- Testing & Verification

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## Unit 11 – PUWER98 in detail

### Objective:-

To appreciate the detailed requirements of the Provision & Use of Work Equipment Regulations (PUWER98).

To illustrate practical method for undertaking a PUWER98 audit and methods for recording the findings and taking action as necessary.

### Key Topics:-

- New machine & first PUWER Audit
- PUWER Assessment & Risk Assessment
- The Regulations:
  - Suitability
  - Maintenance
  - Inspection
  - Specific risks
  - Information & Instructions
  - Training
  - Essential Health & Safety Requirements
  - Dangerous parts of machinery
  - Protection from specific hazards
  - High or very low temperatures
  - Controls & control systems
  - Isolation from energy
  - Stability
  - Lighting
  - Maintenance operations
  - Markings and warnings
- Practical PUWER – Things to look out for
- Recording the findings

## Unit 12 – Integrated Manufacturing Systems

### Objective:-

To appreciate the safety requirements for integrated manufacturing systems (IMS) that incorporate two or more interconnected machines, which could incorporate different technologies, for specific applications, such as component manufacturing or assembly.

To examine the requirements for safe design, zoning, safeguarding and information for the use of integrated manufacturing systems.

### Key Topics:-

- Appreciation of Standard ISO 11161
- Identification of “Task Zones” within the IMS
- Risk assessment and risk reduction in IMS
- Safeguarding and “span of control”
- Protective measures and muting & blanking in IMS
- Measures for the escape & trapping of persons
- Documentation & Information for use
- Validation of IMS's

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