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## 3-day course

### Course Overview

This course, held over three days, is aimed at teaching best practice design principles for the design, construction and operation of computer rooms and data centres. It consists of a number of subsections that address the fundamental requirements of a successful design such as electrical power supply, air conditioning and data cabling. Best practice is achieved by bringing together the requirements of British Building Regulations, Statutory Instruments, EC Directives and British and European standards. Several case studies are considered to see examples of good, and bad, practice in real situations. The unit is principally assessed by an ongoing design exercise that lead the students through all the steps needed to arrive at a baseline design of a modern data centre.

### Industry orientation

#### 1 Introduction

- TIA 942 and European standards
- TIA 942 spaces and hierarchical model
- Example projects and costings
- Size of market
- Intro to Uptime Model of Tiering

#### 2 Facilities and location

- TIA 942 recommendations for location, size, heights, floor loading, lighting and raised floors
- Audits of designs
- Emergency lighting and signage
- Services and facilities

#### 3 Raised floor design

- TIA 942 recommendations
- (PSA) Method of Building Performance Specification 'Platform Floors (Raised Access Floors)', MOB PF2 PS
- BS EN 12825:2001
- Calculating floor heights
- Ramps and the Disability Discrimination Act
- Earthing and bonding

#### 4 Rack location

- TIA 942 and ASHRAE recommendations
- Hot aisle/cold aisle model
- 7-tile pitch model
- Underfloor plenum air distribution
- What makes a rack a server rack?
- 4-post and 2-post systems
- Using tools like Visio and Netzoom

#### 5 Power supplies

- Some electrical principles, volts, amps, watts, kVA, power factor and three phase
- Electrical distribution codes
- Power density
- TIA 942 requirements
- TIA 942 Tiers
- The meaning of N, N+1, 2(N+1) etc
- Estimating power requirements
- Uninterruptible Power Supply (UPS) options
- Power distribution to and in a rack
- Power Distribution Units

#### 6 HVAC

- Basics of air conditioning principles
- Comfort v precision air con
- TIA 942 requirements
- Fresh air and ventilation requirements
- Power consumption of air conditioning
- Air conditioning options
- Underfloor plenum approach
- Hot aisle/cold aisle model
- The limiting factors for free cooling of racks via floor vents
- Fan assisted floor vents and fan assisted racks
- Min and max throw distances for under-floor air
- Side to side cooling
- Upgrade paths
- Chilled water racks
- Testing
- TIA 942 Tiering for HVAC

#### 7 Earthing

- Applicable standards
- The terminology of earthing, grounding and bonding
- Equipotential bonding
- Functional earths
- TIA 942 requirements
- The Signal Reference Grid (SRG)
- SRG spacing and connection

#### 8 Cable containment

- Applicable standards
- Separation of power and data cables to EN 50174 and BS 6701 and TIA 942
- Types of conduit, trunking, tray etc available
- Fill rules
- Cable management in and to a rack
- Fire stopping
- Earthing and bonding

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75% Theory 25% Practical



### Qualification

BTEC Advanced Award in  
Data Centre Design  
BICSI CECs: 14 RCDD  
CNet Course Certificate

### Who should attend

IT Managers, Project Managers,  
Facilities Managers,  
Designers and Consultants

### Related Training

Advanced Data Centre Power  
Advanced Data Centre HVAC  
Data Centre Management

### Course objectives

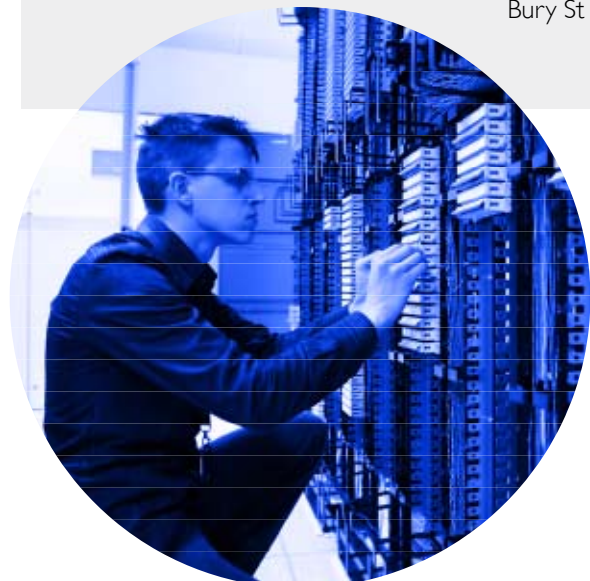
This one day course discusses the problems and the cooling options available to enable data centres to meet their objectives in a rapidly changing world.

### Prerequisites

Some knowledge of basic IT and electrical engineering skills

### Course Location

Bury St Edmunds  
Suffolk



### “Very relevant to everyday working environment” - Major City Bank

#### 9 Fire design

- Fire detection and suppression requirements of TIA 942
- Pre-action sprinkler system
- Approved gaseous fire suppression chemicals (clean agent)
- Smoke detector selection
- Aspirating smoke detectors (VESDA)
- BS 5839 requirements for fire detection
- 'L' and 'M' categories
- Siting of fire/smoke detectors
- NFPA 75 requirements
- Cables for smoke detectors and alarm systems

#### 10 Fire – cabling

- Fuel loads of different cable materials
- American building codes
- The riser and plenum grade of cable
- NFPA 262
- Limited Combustible cables
- European Directives
- The Construction Products Directive
- European fire tests and standards
- Insurance perspectives
- Comparing US and European specs
- Relative costs

#### 11 Copper cabling components

- 10GBASE-T and CAT6A standards
- Manufacturers' offerings for CAT6A
- Screened v unshielded cables
- Horizontal, vertical and angled patchpanels

#### 12 Optical cabling components

- Optical connectors, past and present
- Optical patch panels and accessories
- Types of optical cable, loose tube and tight buffered

#### 13 Preterminated cabling

- Advantages and disadvantages of preterminating cables
- The MPO and MTP ribbon connector
- Some manufacturers' examples

#### 14 Optical systems

- The OM1, OM2, OM3, OS1 model
- The OF300, OF500 and OF2000 model
- Optical component loss and link power budgets
- Ethernet's cable requirements
- 10GBASE-xyz cable requirements
- 10GBASE-xyz transmission distances
- Premium fibres
- How many connectors allowed in a channel?
- 10GBASE-LRM
- ISO 11801:2002 requirements for optical systems

#### 15 Cable system design

- The 2,3 and 4 connector model from ISO 11801
- Intelligent patching
- The hierarchical structure of a data centre
- LAN and SAN layouts
- Differences between TIA 942 and EN 50173-5 terminology
- TIA 942 topology

#### 16 Security, access control, CCTV and BMS

- Fire detection and monitoring
- Security and access control
- CCTV
- Building management systems
- TIA 942 requirements for security and monitoring
- IP networks that integrate security and monitoring
- Rack level monitoring systems

#### 17 Project management issues

- Safety audits
- Health & safety issues
- Construction Design and Management regulations
- TIA 942 redundancy and Tiering in more details



#### Learning outcomes and assessment criteria

##### Learning outcomes

1 Understand the concepts of data centre design in terms of resilience, location, architectural and physical constraints

2 Understand basic regulatory and H&S requirements such as emergency lighting and signage, fire stopping, ventilation, use of electricity at work and fire safety

##### Assessment criteria for pass

To achieve each outcome a learner must demonstrate the ability to:

Give a substantially correct response to Questions 1 to 8 of the design exercise workbook compared to the model answer

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