CAPITOLINE
DATA CENTRES AND IT INFRASTRUCTURE

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Data Centre Operational Management

DCOM

Lesson plan

Learning outcomes	Assessment criteria
1. Understand the importance of energy efficiency in data centres, how to measure it and how to improve it.	Demonstrate through exercise an ability to calculate DCiE and PUE and identify how these efficiency figures can be improved upon.
2. Understand the basic of capacity management in a data centre and make simple calculations	Calculate some examples of power and cooling capacity and identify adequacy.
3. Understand how poor layout and procedures lead to serious business continuity issues in a data centre	Analyse some examples of bad practice and identify how improvements can be made to reduce risk and increase energy efficiency.
4. Understand the basics of successful data centre operational management including the documentation which should be in place and the policies and procedures to operate.	Obtain a mark of at least 60% in the multiple choice test of 40 questions

DAY 1		
Session	**Contents**	**Class activities**
Introduction Day 1 0900 -0930	➢ Introduction to the subject ➢ Why do data centres fail? A review of published data centre failure tables and Capitoline's own analysis of failure modes	
SAVING ENERGY		
Understanding the green agenda and metrics Day 1 0930-1030	➢ PUE and DCiE ➢ The Green Grid ➢ Energy Star ➢ LEED/BREEAM schemes ➢ US Environmental Protection Agency ➢ EU Code of Conduct & Best Practice ➢ TUI and CADE ➢ Power and CO_2 relationships	
Building Management Systems and monitoring Day 1 1045-1145	➢ What is a BMS? ➢ What should be monitored and when ➢ EU Code of conduct requirements ➢ Bringing it all together with a Control Room	Exercise 1 Calculate DCiE, PUE and UPS efficiency? What is the Tier rating?
Improving rack and floor layout Day 1 1145 - 1245	➢ Ideal rack layouts and hot aisle/cold aisle models ➢ Optimising equipment layout within a rack ➢ Cabling: how not to make a mess ➢ Correcting layout to improve energy efficiency	Exercise 2 What's wrong? Faults in real examples?
Improving Power Efficiency Day 1 1345 - 1430	➢ Amps, volts, kW, kVA and power factor ➢ What is 3 Phase? ➢ Balancing your phases! ➢ How to make energy savings in the power system. ➢ Why does power factor matter?	Exercise 3 Is this 3 phase load balanced?
IMPROVING RELIABILITY		
Understanding the power flow Day 1 1430-1530	➢ The energy train from mains input to the rack, in block diagram form ➢ Essential block diagram items e.g. generators, UPS, batteries, PDU etc ➢ N, N+1 and 2N models ➢ Typical power problems and how to avoid them	
Capacity Management Day 1 1545 - 1700	➢ Understanding Capacity Management ➢ How does poor capacity management effect resilience? ➢ What can happen if you get it wrong?	Exercise 4 How long until my room overheats?

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DAY 2		
Session	**Contents**	**Class activities**
Correct operational procedures and documentation Day 2 0900 -1030	➢ IT technical policies ➢ Asset register ➢ Visitor and security policy ➢ Building operational settings ➢ Critical alarms and settings ➢ Maintenance plans ➢ Incident management ➢ Call list ➢ Permit to work ➢ Site H&S manual ➢ Change control and work orders ➢ Fire safety plans, detection and alarms ➢ Staff and contractor proof of competence ➢ Disaster recovery plan ➢ Housekeeping ➢ Responsibilities in the Data Centre ➢ Labelling & Signs	
MEETING THE PHYSICAL REQUIREMENTS OF EXTERNAL AUDIT STANDARDS		
Security requirements Day 2 1045 - 1130	➢ TIA 942 security definitions ➢ British Government Policy framework ➢ BICSI 002 standard ➢ Payment Card Industry security standard ➢ Access control ➢ CCTV ➢ Visitor and security policy	
Data Centre Audits Day 2 1130 - 1230	➢ How do you manage external audits internally? ➢ What do we audit against? What do you want to achieve through audit?	Exercise 5 Analysing the results of an audit?
PLANNING FOR DISASTER RECOVERY AND OTHER CHANGES		
Business Continuity and Disaster Recovery Day 2 1330 -1415	➢ External & Internal Risks ➢ ISO 27000 series ➢ BS25777 ➢ NFPA 1600 ➢ Combining good design and procedures to ensure business continuity ➢ Defining DR requirements ➢ Defining a DR plan and rehearsing it ➢ Communicating with customers and stakeholders ➢ Sizing the DR facility	
Consolidation & moves/upgrades Day 2 1415 - 1530	➢ Why consolidate? ➢ What are the benefits? ➢ What are the problems? ➢ What to consider.	
Final exam and feedback 1500 -1700		Final exam

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