

*Advanced Data Center Design Program*  
*(A 3-day Instructor led Program)*

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## *Training Summary*

Global Solution Partners LLC is pleased to present this **3-Day Advanced Data Center Design, Calculation & Implementation Program**, crafted for data center engineers, facility teams, and infrastructure professionals who need to master real-world, end-to-end data center design. This program transforms participants' understanding from "basic infrastructure awareness" to **design-level competency** by covering:

- ✓ Advanced electrical sizing & single-line diagrams
- ✓ Mechanical & cooling load calculations
- ✓ Fire protection design principles
- ✓ Monitoring, DCIM, architectural planning
- ✓ Tier III/IV design case studies
- ✓ BOQ preparation and budgeting
- ✓ Final certification exam

Through intensive hands-on calculations, scenario-based workshops, and design simulations, participants gain practical skills needed to design, evaluate, and implement modern Tier III/Tier IV data centers aligned with international standards (IEC, Uptime Institute, NFPA, ANSI/TIA-942).

## *Course Objectives and Learning Outcomes*

By the end of this program, participants will be able to:

### **1. Perform Precise Load Calculations**

Compute IT loads, non-IT loads, diversity factors, UPS losses, future growth margins, PUE impact, and total power demand.

### **2. Design Redundant Electrical Architectures**

Develop Tier III/Tier IV compliant electrical SLDs with dual power paths, redundancy configurations (N+1/2N/2N+1), generator sizing, and battery autonomy.

### **3. Execute Accurate Cooling Load Estimations**

Evaluate sensible & latent heat loads, IT thermal output, infiltration loads, humidity considerations, and size CRAC/CRAH/chiller units accordingly.

### **4. Apply Industry-Standard Mechanical Design Principles**

Adopt best practices in airflow management, containment, filtration, humidity control, and mechanical redundancy.

### **5. Implement Fire Protection & Safety Designs**

Select between VESDA, smoke detectors, gaseous suppression, pre-action systems, and compute agent quantity per room volume.

### **6. Integrate Security, Monitoring & DCIM**

Design layered physical security, surveillance, environmental monitoring, and centralized DCIM dashboards.

### **7. Plan Architectural & Civil Infrastructure**

Lay out data halls, raised floor heights, aisle spacing, cable routing, seismic reinforcement, fire-rated partitions, and accessibility paths.

### **8. Consolidate Multi-Disciplinary Systems into a Tier III/IV Design**

Apply a cohesive, integrated design strategy across electrical, cooling, structural, and operational domains.

### **9. Prepare a Detailed Bill of Quantities**

Translate design requirements into a BOQ including materials, ratings, quantities, unit pricing, and 10% contingency.

### **10. Achieve Certification**

Pass a structured technical exam covering theory, calculations, and a mini design case problem.

## Day-Wise Curriculum

### DAY 1 – ELECTRICAL INFRASTRUCTURE, LOAD CALCULATIONS & REDUNDANCY

Day	Focus Area	Topics & Activities	Learning Outcomes
Day 1	Fundamentals, Power Systems & Redundancy	<p><b>Module 1 – Introduction &amp; Training Overview</b></p> <ul style="list-style-type: none"> <li>• Tier III (N+1) and Tier IV (2N+1) definitions</li> <li>• IT vs Non-IT load differences</li> <li>• IEC, Uptime ATD, TIA-942 standards</li> <li>• Data center failure analysis icebreaker</li> </ul> <p><b>Module 2 – Power Load Calculations (IT vs Non-IT)</b></p> <ul style="list-style-type: none"> <li>• Server/rack nameplate ratings</li> <li>• Diversity &amp; derating factors</li> <li>• PUE fundamentals</li> <li>• UPS losses &amp; inefficiencies</li> <li>• Hands-on: compute total kW for example hall</li> </ul> <p><b>Module 3 – Electrical Distribution &amp; SLD Basics</b></p> <ul style="list-style-type: none"> <li>• Dual A/B feed design</li> <li>• Transformers, switchgear, ATS/STS</li> <li>• Tier III/IV SLD walkthrough</li> <li>• Group activity: draw redundant SLD</li> </ul> <p><b>Module 4 – Cable, Panel &amp; MCCB Sizing</b></p> <ul style="list-style-type: none"> <li>• Feeder current calculations</li> <li>• Cable selection &amp; oversizing strategy</li> <li>• MCCB frame rating and breaking capacity</li> <li>• Exercise: feeder cable sizing</li> </ul> <p><b>Module 5 – Generator &amp; Battery Sizing; Earthing</b></p> <ul style="list-style-type: none"> <li>• Diesel generator sizing (IT load + infra + spare)</li> <li>• Fuel autonomy for 12–24 hours</li> <li>• Battery autonomy calculations (Ah formula)</li> </ul>	<ul style="list-style-type: none"> <li>• Accurately compute IT + Non-IT load requirements</li> <li>• Draft Tier-compliant electrical SLDs</li> <li>• Size cables, breakers, generators &amp; batteries</li> <li>• Understand redundancy architecture for Tier III/IV</li> <li>• Apply grounding and earthing standards effectively</li> </ul>

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		<ul style="list-style-type: none"> <li>• IEC/IEEE earthing principles</li> </ul>	
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### DAY 2 – COOLING, MECHANICAL SYSTEMS, FIRE PROTECTION & SECURITY

Day	Focus Area	Topics & Activities	Learning Outcomes
Day 2	Mechanical Systems, Cooling, Fire & Security	<p><b>Module 6 – Cooling Load Calculations</b></p> <ul style="list-style-type: none"> <li>• Sensible &amp; latent heat</li> <li>• IT thermal output</li> <li>• Lighting, UPS, infiltration, humidity loads</li> <li>• Calculation worksheet for CRAC/CRAH capacity</li> </ul> <p><b>Module 7 – HVAC System &amp; Chiller/CRAC Selection</b></p> <ul style="list-style-type: none"> <li>• CRAC/CRAH/chiller technologies</li> <li>• N+1 cooling plant configuration</li> <li>• Hot/cold aisle containment</li> <li>• Raised floor plenum management</li> <li>• Retrofit case study (20% load increase)</li> </ul>	<ul style="list-style-type: none"> <li>• Compute and justify cooling load requirements</li> <li>• Select appropriate precision cooling systems</li> <li>• Design compliant fire detection &amp; suppression systems</li> <li>• Build layered physical security architecture</li> <li>• Integrate DCIM/EMS for full environmental visibility</li> </ul>

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**Module 8 – Fire Protection Systems**• NFPA 75/76 compliance

- VESDA & smoke detection
- Gas suppression (FM200, NOVEC, Inergen) selection
- Calculation of gas agent concentration
- Emergency response role-play

**Module 9 – Security & Monitoring (DCIM/EMS/CCTV)**

- Access control & biometrics
- CCTV coverage & integration• Environmental sensors: temp, humidity, water leak
- DCIM dashboards for power & cooling• Group task: layered security framework

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DAY 3 – INTEGRATED DESIGN, ARCHITECTURE, BOQ & CERTIFICATION

Day	Focus Area	Topics & Activities	Learning Outcomes
Day 3	Architecture, Layout, BOQ & Certification	<p><b>Module 10 – Architectural &amp; Layout Considerations</b></p> <ul style="list-style-type: none"> <li>• Aisle spacing, cold aisle <math>\geq 1.2\text{m}</math></li> <li>• Raised floor height <math>\geq 600\text{mm}</math></li> <li>• Column spacing &amp; hall layout</li> <li>• Overhead vs underfloor cable routing</li> <li>• Fire-rated walls &amp; doors</li> <li>• Seismic reinforcement</li> </ul> <p><b>Module 11 – Tier III/IV Design Case Study Workshop</b></p> <ul style="list-style-type: none"> <li>• 2MW design scenario</li> <li>• SLD + cooling + architectural integration</li> <li>• Apply N+1 redundancy across systems</li> <li>• Peer review presentations</li> </ul> <p><b>Module 12 – BOQ Preparation &amp; Budgeting</b></p> <ul style="list-style-type: none"> <li>• Translating design into BOQ</li> <li>• Rating, quantities, unit pricing</li> <li>• Excel exercise: BOQ compilation + 10% contingency</li> </ul> <p><b>Module 13 – Review, Q&amp;A, Exam Prep</b></p> <ul style="list-style-type: none"> <li>• Recap all modules</li> <li>• Quick quiz / flashcards</li> </ul> <p><b>Module 14 – Final Certification Exam</b></p> <ul style="list-style-type: none"> <li>• 60–90 min written test •</li> <li>• MCQ, design-based questions, calculation problems</li> </ul>	<ul style="list-style-type: none"> <li>• Produce compliant architectural layouts</li> <li>• Integrate electrical, cooling &amp; civil designs</li> <li>• Prepare a complete BOQ and cost estimate</li> <li>• Demonstrate mastery through case-study design</li> <li>• Successfully complete certification exam</li> </ul>

## *Training Methodology and Format*

- ✓ Expert-led technical lectures with real engineering case studies
- ✓ Hands-on calculation worksheets & formula-based exercises
- ✓ Group design simulations (SLD drafting, cooling layout, BOQ creation)
- ✓ Scenario-based activities for fire, security, and redundancy decisions
- ✓ Daily quizzes for reinforcement
- ✓ 3-day structured progression from fundamentals → design → integrated planning

## *Deliverables*

- ✓ 3 full days of advanced instruction
- ✓ Comprehensive course materials (notes, worksheets, design templates, BOQ templates)
- ✓ Hands-on tools for calculations and design
- ✓ Final written certification exam
- ✓ Certificates of Completion
- ✓ A Training Summary Report for management
- ✓ 30-day post-training support for clarifications