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# EE372:
# Professional Certificate in Power System Simulation Using Generative AI

## Training Description:

This intensive training course provides participants with a deep understanding of power system simulation enhanced by Generative AI (Gen AI) techniques. Traditional power system modeling and simulation are evolving with AI-driven approaches that improve prediction accuracy, scenario analysis and operational decision-making. Participants will learn how to integrate generative AI into load flow studies, contingency analysis, fault detection, renewable integration and system optimization. The training course combines theoretical foundations, hands-on exercises, and real-world case studies to enable participants to apply AI-driven simulation in modern power networks.

The training course will cover the fundamentals of power system simulation, the role of AI and Gen AI in enhancing model efficiency, practical software tools and developing AI models to simulate various operational scenarios. By the end of the course, participants will be able to leverage Gen AI to predict system behavior, identify potential risks and support data-driven decision-making in power system operations.

## Training Objectives:

**By the end of the training, participants will be able to:**

- ✓ Understand the fundamentals of power system simulation and key analysis techniques
- ✓ Recognize the role of AI and generative AI in modern power system modeling
- ✓ Develop AI-based models for load flow, contingency, and fault analysis
- ✓ Simulate power system behavior under different operational and renewable integration scenarios
- ✓ Analyze simulation results to support planning, operation, and risk mitigation
- ✓ Apply practical tools and frameworks for integrating Gen AI in power system studies

## Training Designed for:

This training course is intended for Power system engineers and operators, Electrical engineers working in utilities or energy companies, Energy analysts and researchers in renewable integration, AI engineers focusing on energy sector applications and professionals in power systems, electrical engineering, or AI applied to energy.

## Training Requirement:

"Hand's on practical sessions, equipment and software will be applied during the course if required and as per the client's request."

Contents can be adapted to your specific wishes. It is therefore possible to focus on specific modules of the training course as per client's learning needs and objectives. Further, it should be forwarded to us a month prior to the course dates.

## Training Program:

***DAY ONE:***

- ❖ **Introduction to Power System Simulation & AI Fundamentals**
  - Overview of power system components and network modeling
  - Types of power system analysis: load flow, short circuit, stability, contingency

- Introduction to AI and Generative AI (Gen AI) concepts
- Role of AI in power system simulation
- Hands-on: Setting up a basic power system model in simulation software
- Case study: AI-assisted load forecasting

*DAY TWO:*

❖ Load Flow Analysis with Generative AI

- Fundamentals of load flow analysis: Newton-Raphson, Gauss-Seidel methods
- Limitations of conventional simulation approaches
- Using Gen AI for load flow prediction and optimization
- Data preparation and feature selection for AI models
- Hands-on: Developing a Gen AI load flow simulation model
- Interpreting AI-generated results for operational decision-making

*DAY THREE:*

❖ Contingency and Fault Analysis Using AI

- Contingency analysis in power systems: N-1 and N-2 scenarios
- Fault detection and classification techniques
- Gen AI approaches for simulating contingencies and fault scenarios
- Training AI models with historical grid data
- Hands-on: Fault analysis and contingency simulations with AI-generated scenarios
- Case study: AI-driven reliability assessment

*DAY FOUR:*

❖ Renewable Integration & Optimization

- Challenges in renewable energy integration
- AI-assisted generation scheduling and grid stability assessment
- Simulation of solar, wind and hybrid systems with AI
- Optimization of power flows and voltage stability using AI models
- Hands-on: Scenario simulation for renewable-dominant systems
- Case study: AI-enhanced microgrid simulation

*DAY FIVE:*

❖ Advanced AI Techniques & Practical Applications

- Generative models: GANs, Diffusion Models, Transformers in power system simulations
- Predictive maintenance and anomaly detection with AI
- Power system risk assessment using AI simulations
- Integration of AI simulation with SCADA/EMS systems
- Hands-on: End-to-end AI-based power system simulation project
- Presentation: Simulation results and insights
- Discussion: Future trends in AI-driven power system simulation

❖ Course Conclusion

❖ POST-ASSESSMENT and EVALUATION

## Training Methodology:

This interactive training course includes the following training methodologies as a percentage of the total tuition hours:

- 30% Lectures, Concepts, Role Play
- 70% Workshops & Work Presentations, Techniques, Based on Case Studies & Practical Exercises, Gamification, Software & General Discussions
- Pre and Post Test

## Training Certificate(s):

CMCT Internationally recognized certificate(s) will be issued to each participant who completed the course.

## Training Fees:

**TBA as per the locations -** This rate includes participant's manual, hand-outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

*Note: The 5% VAT (Value Added Tax), will be effective starting 01st of January 2018 as per the new regulation from the UAE Government. The VAT applies for all quotation both for local and abroad.*

## Training Timings:

**Daily Timings:**

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|---|---|
| 07:45 - 08:00 | Morning Coffee / Tea |
| 08:00 - 10:00 | First Session |
| 10:00 - 10:20 | Recess (Coffee/Tea/Snacks) |
| 10:20 - 12:20 | Second Session |
| 12:20 - 13:00 | Recess (Prayer Break & Lunch) |
| 13:00 - 14:00 | Last Session |

**For training registrations or in-house enquiries, please contact:**
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