Digital Twin and Smart Manufacturing for Chemical Plants Training Course

Ref: #ACE9918

Course Introduction / Overview:

This training course gives a comprehensive look into the core principles of digital twin technology and its use in smart manufacturing for chemical plants. The fourth industrial revolution, or Industry 4.0, is transforming how industries operate, with digital twins at the forefront of this change. A digital twin is a virtual model of a physical asset, process, or system that can be used to monitor, simulate, and optimize performance in real time. This course gives participants a solid foundation in the fundamental concepts of digital twins, from data acquisition and modeling to real-time simulation and predictive analytics. We explore how to integrate these digital models with smart sensors and control systems to create fully automated and optimized manufacturing environments. The curriculum is informed by leading academic research in the field. For instance, the book Digital Twin: The Art of Physical and Digital Interconnection by Y. W. Pan and H. J. Chen is a foundational reference that gives an in-depth look at the subject. BIG BEN Training Center is committed to giving a forward-thinking curriculum that equips professionals with the skills needed to innovate and lead the digital transformation in their organizations.

Target Audience / This training course is suitable for:

- Process and chemical engineers.
- Automation and control system engineers.
- IT and data scientists.
- Plant managers and operations leaders.
- Project managers in industrial automation.
- Researchers in industrial digitalization.
- Academics and students in related fields.

Target Sectors and Industries:

- Chemical and petrochemical manufacturing.
- Oil and gas.
- Pharmaceuticals.
- Power generation.
- Consulting and engineering firms.
- Government agencies and research institutes.
- Technology and software providers.

Target Organizations Departments:

- Process control and automation.
- Information technology (IT).
- Research and development.
- Operations and production.
- Digital transformation.
- Asset management.
- Engineering and design.

Course Offerings:

By the end of this course, the participants will have able to:

- Describe the concept and architecture of a digital twin.
- Understand the role of IoT and smart sensors in data collection.
- Build a basic digital twin for a chemical process unit.
- Use simulation to optimize process parameters and predict outcomes.
- Implement predictive maintenance using real-time data.
- Integrate digital twins with existing control systems.
- Analyze data from a digital twin to improve efficiency.
- Discuss the challenges and future of smart manufacturing.

Course Methodology:

This training course uses a blend of theoretical instruction, guided exercises, and hands-on projects to give a dynamic learning experience. The curriculum combines theoretical lectures with real-world case studies to bridge the gap between academic concepts and practical application. Participants will use hands-on activities, including group workshops and scenario-based exercises, to reinforce their understanding of key topics. We use discussions and Q&A sessions to encourage a collaborative learning environment, where participants can share experiences and insights. The course also includes an in-depth analysis of successful and unsuccessful projects from various industries to highlight best practices and common pitfalls. This approach gives participants the confidence to apply their new knowledge directly to their professional roles. At BIG BEN Training Center, we believe that an engaging and interactive format is key to mastering new skills, so we focus on giving immediate feedback and continuous support throughout the training. The methods are designed to ensure every participant leaf with a clear, practical skill set.

Course Agenda (Course Units):

Unit One: Fundamentals of Digital Twin Technology.

- Introduction to the digital twin concept.
- Physical and digital model components.
- Data acquisition from industrial assets.
- Key technologies: IoT, AI, and big data.
- Applications in chemical process engineering.

Unit Two: Building the Digital Twin.

- Process modeling and simulation basics.
- Data integration and model calibration.
- Creating a virtual process environment.
- Hardware and software requirements.
- Case study: a simple process unit digital twin.

Unit Three: Advanced Analytics and Optimization.

- Predictive maintenance using digital twins.
- Real-time process optimization.
- Root cause analysis and troubleshooting.
- Machine learning for process control.
- Risk assessment and safety analysis.

Unit Four: Smart Manufacturing and Integration.

- Introduction to smart manufacturing.
- Integrating digital twins with control systems.
- Distributed control systems (DCS) and SCADA.
- Cybersecurity in a connected plant.
- Digital twin for supply chain management.

Unit Five: Implementation and Future Trends.

- Developing a digital transformation strategy.
- Challenges in implementation.
- Economics and return on investment.
- Future trends: holographic twins and augmented reality.
- Case study: a full plant digital twin.

FAQ:

Qualifications required for registering to this course?

There are no requirements.

How long is each daily session, and what is the total number of training hours for the course?

This training course spans five days, with daily sessions ranging between 4 to 5 hours, including breaks and interactive activities, bringing the total duration to 20 - 25 training hours.

Something to think about:

How can digital twin technology, combined with sustainable practices, be used to significantly reduce the environmental footprint and energy consumption of chemical manufacturing plants?

What unique qualities does this course offer compared to other courses?

This training course is unique because it combines a strong technical foundation in digital twin technology with a very practical, hands-on approach to its use in the chemical industry. While many courses discuss the theory of Industry 4.0, our program shows you how to build and apply these technologies to solve real-world problems. We don't just teach you about concepts; we help you find out how to integrate digital models with physical assets to improve efficiency and reduce costs. The curriculum is heavily focused on real-world case studies and exercises, enabling participants to get a true feel for how these projects are done. It’s an advanced program that gives professionals the skills needed to lead the digital transformation in their organizations and drive innovation in a competitive market.