



## Electrical Engineering I - M124V (for Shell employees only)

### COURSE

#### About the Course

This course is the first technical electrical course in the professional development program for Shell Electrical Engineers.

It has been developed through a collaboration with Shell and PetroSkills and is focused on getting electrical engineers up to speed with the essential principles of electrical safety, system design and maintenance. Additionally, this course introduces the participants to the critical elements of relevant Shell DEPs that they will use in their daily work.

The course focuses on foundational concepts rather than regional code and standard requirements, but does cover common international (IEC, EN, BS, etc.) and North American (NEC, IEEE) standards related to design and safe operation.

This intensive program is held over 10 8-hour sessions in two weeks and has been designed to be delivered virtually. As such, the expectation is that participants fully engage online, ask and answer questions posed in the course and participate in meaningful discussions related to the concepts, implications, and application of the concepts. A sample project will be completed in phases throughout the course, giving the participants an opportunity to work with their peers in solving typical design challenges and applying concepts and Shell standards. Offline time will be allotted before, during, and after the course to allow participants to complete assignments at their own pace.

At the end of the course, participants will complete a formal written final exam, and must pass or remediate the exam to receive credit for the course.

#### Target Audience

This course has been designed for Electrical Engineers with a bachelor's or master's degree (or equivalent) in electrical engineering and 1-3 years' experience on the job and Senior Electrical and Instrument Technicians or Supervisor whose activities include work on electrical equipment in refineries, gas and chemical plants or oil field installations.

It is assumed that participants will come to the course with academic background in the fundamentals of AC and DC electricity, 3-phase power systems, basic electrical mathematic principles (Ohm's Law, Kirchhoff's laws, etc.), phasor math, basic understanding of the role of common industrial power system equipment and components (Substations, Generators, transformers, switchgear, protective devices, cables, conduit, etc.).

Basic knowledge of Shell internal systems including locating Shell and Industry standards is expected.

It is beneficial if students have some practical experience working in industrial facilities so that they can understand the context of the material presented.

This course will be held in English. Participants should be fluent in English with proficiency such that they can participate in technical discussions.

## You Will Learn

By the end of the course, participants should be able to:

- Work safely in and around electrical equipment and understand their role in electrical safety
- Locate and use company standards for electrical projects, ongoing maintenance, and operation of a facility
- Design a simple facility starting from a load list and produce a single line diagram indicating the basic arrangements and key parameters of electrical equipment.
- Incorporate appropriate levels of contingency and considerations for future growth
- Describe the effect on power system behavior when operating in various configurations (e.g., Ties Closed or Open, Dual or Single feed)
- Calculate fault levels and short circuit currents including motor contribution by hand using the per unit method
- Calculate voltage drop during motor start by hand using the per unit method
- Calculate the voltage profile of a power system under various operating conditions
- Perform simple protection coordination studies by hand and determine basic protective device selection.
- Select the key parameters/ratings for switchgear, transformers, generators, UPS systems, circuit and equipment protection, motors, and motor starters for common applications
- Size and select cables based on voltage, steady state load, voltage drop, de-rating factors, fault conditions and environmental factors using both IEC and NEC methods.
- Describe the basic operation of Generators in a power system and their design and operational requirements
- Discuss the considerations and methods used to determine hazardous area classifications.
- Determine the requirements for electrical equipment installed in hazardous (classified) locations
- Describe the considerations for an effective lighting design
- Determine basic maintenance needs of electrical equipment and power systems per company and industry standards
- Explain the use of renewable energies at Shell and discuss future opportunities, considerations, and challenges in implementing them

## Course Content

- Electrical Safety
- Principles of Electrical Design
- Hazardous Locations
- Earthing (Grounding) and Bonding

- Initial System Design Fundamentals
- Initial Electrical System Studies (Fault, Load Flow, Voltage Dip, Voltage profile, etc.)
- Cables and Cable Sizing
- Switchgear
- Transformers
- Motors
- Variable Speed Drives
- Battery and UPS Systems
- Basic Principles of Protection (Selection, Coordination, Protective Relay Systems)
- Generators and Prime Movers
- Electrical Maintenance Aspects

## Product Details

Categories: Upstream

Disciplines: Instrumentation, Controls & Electrical

Levels: Foundation

Product Type: Course

Formats Available: Virtual

Instructors: Jason Pingnot