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Training Center

Training and Development Program 2024

Actively shaping further development - your success is our goal!

Editorial

Active future development - your success is our goal!

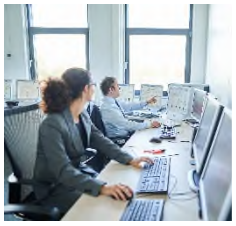
The success and competitiveness of companies fundamentally depend on the expertise of their employees.

An important contribution to this is ongoing vocational learning and targeted training on demand.

Framatome offers comprehensive solutions for the development, construction and maintenance of nuclear power plants. Our offer also includes training for customers and their employees. In our courses we impart the necessary basics, as well as detailed and background knowledge for safe and efficient operation, modernization and maintenance of plants. The Framatome Training Center contributes to maintaining competence in nuclear power plants. Our long-standing international contacts with active nuclear power plant utilities and operators, authorities and institutions, provide important impulses for nuclear safety issues and solutions.

The modular training courses on technology, I&C and Framatome products are oriented toward the requirements of the various groups of users in nuclear power plants and their environment.
On request, we can provide the training sessions to your personnel at locations other than our modern Training Center in Karlstein am Main, Germany.

We can also create individual training programs tailored to the requirements of your company. For further information, please contact us; we will be happy to advise you.



Framatome GmbH

Your reliable partner in training and development matters

Portfolio

Technology Courses

Training courses on power plant technology in the fields of process engineering layout and design of primary- and secondary-side systems, reactor physics and operational practice, nuclear instrumentation, operational and accident behavior, electrical engineering and process engineering requirements for safety I&C and the I&C of the turbine generator set.

I&C Courses

Training courses on safety I&C using the digital system platform TELEPERM XS covering the following topics: architectures, hardware, software, engineering, maintenance, system computer and system administration.
Training courses on hard-wired programmed I&C using the system platform ISKAMATIC and EDM.

Virtual Courses

Courses from all areas of Framatome as an online offer. These courses are conducted using the Skype for Business tool.

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Program Overview

Technology Courses

1

Pressurized Water Reactors
- Introductory courses
- Advanced courses
- Expert courses
- Know-why courses

EPR Reactors
- Introductory courses
- Advanced courses
- Simulator courses

I&C Courses

2

Safety-related I&C TELEPERM XS
- Introductory courses
- Advanced courses
- Expert courses

Hard-wired programmed I&C
- Introductory courses

Virtual Courses

3

Courses from the different areas of Framatome GmbH
- Technology Courses
- I & C Courses

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1

Technology Courses

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PWR Pressurized Water Reactor

Pressurized Water Reactors

Introductory, advanced, expert and know-why courses covering German and international KWU pressurized water reactors (PWR) and courses for ongoing modernization projects in OEM (KWU) plants.

Introductory Courses

- Pages 07 to 24 -

Introductory courses provide a non-plant-specific overview of systems and process engineering features. An overview of the following topics is given: overview of primary- and secondary-side systems, as well as operational and safety-related I&C, nuclear physics and electrical engineering basics.

Advanced Courses

- Pages 25 to 28 -

Advanced courses are plant-specific and provide detailed information on systems and on process related aspects of operational and safety-related I&C. These courses cover the following topics in detail: overview of primary- and secondary-side systems as well as operational and safety-related I&C, nuclear physics and electrical engineering basics.

Expert Courses

- Pages 29 to 32 -

Expert courses are topic-based. They provide necessary understanding of available technical solutions and give background information on systems engineering design and the definition of operating modes in order to provide a deeper understanding of the construction and operational behavior of the plant.

Know-why Courses

- Pages 33 to 38 -

Know-why courses are topic-based in order to impart "knowledge on why something was developed in such a way“. They therefore provide profound knowledge on current technical solutions against the background of historical technical evolution in relation to the development of codes and standards, and where relevant, incidents and accidents (such as TMI). This "know-why“ also refers to the design of systems and the definition of operating modes.

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PWR Introductory Courses

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DWR Introductory Courses

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PWR Introductory Course
Course Number: B211D consisting of five Modules M1 to M5

Target Group

Engineers, technicians, master craftsmen, and administrative personnel of nuclear power plants (also specialist personnel from licensing authorities and expert organizations) who wish to obtain a general overview.

Duration: 6 weeks

Location: Karlstein

Language: German

English on request

Learning Objectives

The course participants acquire an overview on the design and function of individual systems of a pressurized water reactor nuclear power plant. Furthermore, they receive insights into the operational interaction of the systems involved, and into the behavior of the plant during various transients and accidents. The documents used are based on the Philippsburg 2 ("pre-Konvoi") plant. Important differences from other PWR-plants are discussed.

Reference: Konvoi / Pre-Konvoi

Contents

- General basics, introduction and identification system
- Reactor core physics and thermal hydraulic core design
- Design, function and operating principle of the reactor coolant and pressurizer system
- Reactor auxiliary and supporting systems
- Core components, fuel rods, fuel cycle, fuel assembly fabrication
- Auxiliary power, emergency power supply
- Secondary side, main steam system, condenser and vacuum system
- Turbine generator
- Circulating water system, service water systems, component cooling systems
- Turbine electrohydraulic control, overview of the turbine generator
- Excore and incore instrumentation systems
- Nuclear operation practice and operational behavior, radiation protection
- Safety and operational I&C
- Plant behavior during operational transients and accidents

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Prerequisites

Practical experience in a power plant is desirable, but no specific knowledge of nuclear power plants is required.

Note

Participants: 6 to 12 persons

Questions are set for each topic. At the end of the module, if requested, a certificate is issued to candidates who pass a test. Otherwise, a confirmation of attendance is issued.

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PWR Introductory Course: Module 1 - Overview of nuclear Systems
Course Number: B211D M1

Target Group

Engineers, technicians, master craftsmen, and administrative personnel of nuclear power plants who wish to acquire a general overview.

Duration: 2 weeks
Location: Karlstein
Language: German
English on request

Learning Objectives

The course participants acquire an overview of the design and function of nuclear systems in a pressurized water reactor nuclear power plant. They also obtain detailed insights into the design and function of the reactor coolant system and the primary-side auxiliary and safety systems.

Reference: Konvoi / Pre-Konvoi

Contents

- General basics and introduction to the overall plant and power plant identification system (AKZ / KKS)
- Design, function and operating principle of the reactor coolant and pressurization system
- Overview of the reactor auxiliary and supporting systems
- Volume control system
- Boric acid and demineralized water system
- Chemical system
- Coolant purification system
- Coolant degasification system
- Coolant storage and treatment system
- Residual heat removal system and fuel pool cooling system
- Component cooling water system (residual heat removal chain)
- Nuclear HVAC systems
- Gas waste processing and exhaust systems

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Prerequisites

Practical experience in a power plant is desirable, but no specific knowledge of nuclear power plants is required.

Note

Participants: 6 to 12 persons

Questions are set for each topic.

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PWR Introductory Course: Module 2 - Overview of Secondary Side, Cooling Water Systems, Operational I&C | Course Number: B211D M2

Target Group

Engineers, technicians, master craftsmen, and administrative personnel of nuclear power plants who wish to acquire a general overview.

Duration: 5 days
Location: Karlstein
Language: German
English on request

Learning Objectives

The participant acquire an overview of the design and function of the secondary system, the cooling water systems, I&C concept and of the operational I&C concept of a pressurized water reactor nuclear power plant.

Reference: Konvoi / Pre-Konvoi

Contents

- Overview of the secondary system:
  - Main steam system
  - Main condenser system and low-pressure feedwater heating system
  - Feedwater system and high-pressure feedwater heating system
  - Startup and shutdown system
- Circulating water system
- Service water systems
- Secured and conventional closed cooling water systems
- Overview of the I&C concept
- Overview of the operational I&C concept using the condensate system as an example

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Prerequisites

Practical experience in a power plant is desirable, but no specific knowledge of nuclear power plants is required.

Note

Participants: 6 to 12 persons

Questions are set for each topic.

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PWR Introductory Course: Module 3 - Electrical Engineering/Turbine Generator I&C, Auxiliary and Emergency Power Supplies | Course Number: B211D M3

Target Group

Engineers, technicians, master craftsmen, and administrative personnel of nuclear power plants who wish to acquire a general overview.

Duration: 5 days
Location: Karlstein
Language: German
English on request

Learning Objectives

The course participants acquire an overview of the electrical and hydraulic turbine and bypass control system, and of the auxiliary and emergency power supplies of a nuclear power plant.

Reference: Konvoi / Pre-Konvoi

Contents

- Turbine and bypass control systems (electric and hydraulic)
- Overview of the turbine generator set
- Auxiliary power supply
- Emergency power supply

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Prerequisites

Practical experience in a power plant is desirable, but no specific knowledge of nuclear power plants is required.

Note

Participants: 6 to 12 persons

Questions are set for each topic.

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PWR Introductory Course: Module 4 - Physics and Thermal Hydraulics of the Reactor Core, Components, Radiation Protection | Course Number: B211D M4

Target Group

Engineers, technicians, master craftsmen and administrative personnel of nuclear power plants who wish to acquire a general overview.

Duration: 5 days
Location: Karlstein
Language: German
English on request

Learning Objectives

The course participants acquire an overview of thermal hydraulic and core physics processes, core instrumentation, core components, and radiation protection in a pressurized water reactor nuclear power plant.

Reference: Konvoi / Pre-Konvoi

Contents

- Reactor core physics
- Thermal hydraulic core design
- Core components, fuel assemblies, overview of the fuel cycle, fuel fabrication
- Incore and excore instrumentation systems (neutron flux instrumentation, PDD system, aeroball system)
- Nuclear operation practice
- Radiation protection and activity flow in a nuclear power plant

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Prerequisites

Practical experience in a power plant is desirable, but no specific knowledge of nuclear power plants is required.

Note

Participants: 6 to 12 persons

Questions are set for each topic.

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PWR-Introductory Course: Module 5 - Safety I&C, Operational Transients and Accidents | Course Number: B211D M5

Target Group

Engineers, technicians, master craftsmen, and administrative personnel of nuclear power plants who wish to acquire a general overview

Duration: 5 days
Location: Karlstein
Language: German
English on request

Learning Objectives

The course participants acquire an overview of safety-related I&C and plant dynamics of a pressurized water reactor nuclear power plant. Furthermore, the process- and I&C-related design bases are outlined.

Reference: Konvoi / Pre-Konvoi

Contents

- Safety-related I&C
  - Reactor power control
  - Reactor limitation system
  - Reactor protection system
- Behavior of the plant in normal operation, during operational transients and accidents
- Nuclear Safety
  - Safety concept, codes and standards, hardware design

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Prerequisites

Practical experience in a power plant is desirable, but no specific knowledge of nuclear power plants is required.

Note

Participants: 6 to 12 persons

Questions are set for each topic.

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PWR Compact Introductory Course
Course Number: B211D 3W

Target Group

Engineers, technicians and foremen as well as clerks of a nuclear power plant (also technical personnel of authorities as well as consultants) who want to get an overall view.

Duration: 3 weeks
Location: Karlstein
Language: German
English on request

Learning Objectives

The course participants will receive an overview of the structure and function of the individual systems of a nuclear power plant with pressurized water reactor (PWR). Furthermore, an insight is given into the operational interaction of the systems involved as well as into the behavior of the plant in the event of various malfunctions and accidents. The training material used are based on the Philippsburg 2 plant (pre-convoy). Major deviations of other PWR plants are explained.
Reference: Convoy / Pre-convoy

Contents

- General principles and introduction to the overall plant
- Design, function and operation of the reactor cooling and pressuring system
- Reactor auxiliary and ancillary systems
- Overview of the secondary circuit
- Circulating water system, service water systems, component cooling systems
- Reactor core physics and thermal-hydraulic core design
- Core components, fuel assemblies, fuel cycle, fuel assembly fabrication
- Radiation protection and activity flow
- Auxiliary power supply, emergency power supply
- Instrumentation and control concept
- Operational behavior of the overall plant
- Plant behavior during operational transients and accidents

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Prerequisites

Practical experience in a power plant is desirable, but no special knowledge regarding nuclear power plants is required.

Note

Participants: 6 to 12 persons
There will be no seminar work, nor will there be a test.

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PWR Compact Introductory Course
Course Number: B211D 3W M1

Target Group

Engineers, technicians and foremen as well as clerks of a nuclear power plant (also technical personnel of authorities as well as expert organizations) who want to get an overall view.

Duration: 5 days
Location: Karlstein
Language: German
English on request

Learning Objectives

The course participants are given an overview of the structure and function of the nuclear systems of a nuclear power plant with pressurized water reactor and a detailed insight into the structure and function of the primary circuit and the volumetric control system. Furthermore, an overview of the secondary circuit and the main and auxiliary cooling water systems.

Reference: Convoy / Pre-convoy

Contents

- General principles and introduction to the overall plant
- Design, function and operation of the reactor coolant and pressurizing system (primary circuit)
- Overview of the reactor auxiliary and ancillary systems
- Volume control system
- Overview of the secondary circuit
- Circulating and service water systems

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Prerequisites

Practical experience in a power plant is desirable, but no special knowledge regarding nuclear power plants is required.

Note

Participants: 6 to 12 persons
There will be no seminar work, nor will there be a test.

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PWR Compact Introductory Course
Course Number: B211D 3W M2

Target Group

Engineers, technicians and foremen as well as clerks of a nuclear power plant (also technical personnel of authorities as well as expert organizations) who want to get an overall view.

Duration: 5 days
Location: Karlstein
Language: German
English on request

Learning Objectives

The course participants will gain a detailed insight into the structure and function of the nuclear systems of a nuclear power plant with pressurized water reactor (apart from the volume control system) and into the physics of the reactor core as well as into the core components and fuel assembly design.

Contents

- Reactor core physics
- Core components, design configuration of fuel assemblies
- Boric acid and demineralized water control system
- Chemical control system
- Coolant purification
- Coolant degasification
- Coolant storage and treatment
- Nuclear residual heat removal system and fuel pool cooling system
- Component cooling system (residual heat removal chain)
- Nuclear ventilation system
- Gaseous waste processing system

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Prerequisites

Practical experience in a power plant is desirable, but no special knowledge regarding nuclear power plants is required.

Note

Participants: 6 to 12 persons
There will be no seminar work, nor will there be a test.

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PWR Compact Introductory Course
Course Number: B211D 3W M3

Target Group

Engineers, technicians and foremen as well as clerks of a nuclear power plant (also technical personnel of authorities as well as expert organizations) who want to get an overall view.

Duration: 5 days
Location: Karlstein
Language: German
English on request

Learning Objectives

The course participants are given an overview of radiation protection and activity flow in the NPP, the auxiliary and emergency power supply of a nuclear power plant, the instrumentation and control concept of a nuclear power plant with pressurized water reactor, and the of the plant in normal operation, during operational transients and accidents.

Contents

- Radiation protection and activity flow in NPP
- Auxiliary power supply
- Emergency power supply
- Instrumentation and control technology concept
- Behavior of the plant in normal operation, during operational transients and accidents

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Prerequisites

Practical experience in a power plant is desirable, no special knowledge regarding nuclear power plants is required.

Note

Participants: 6 to 12 persons
There will be no seminar work, nor will there be a test.

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PWR Short Introductory Course
Course Number: B226D

Target Group

Engineers, technicians, master craftsmen, and administrative personnel of nuclear power plants (also specialist personnel from licensing authorities and expert organizations) who wish to obtain a general overview.

Duration: 5 days
Location: Karlstein
Language: German
English on request

Learning Objectives

The course participants acquire an overview on the design and function of individual systems of a pressurized water reactor nuclear power plant. Furthermore, they receive insights into the operational interaction of the systems involved.
The documents used are based on the Philippsburg 2 ("pre-Konvoi") plant.

Contents

- General basics and introduction to the overall plant
- Design, function and operating principle of the reactor coolant and pressurization system
- Overview of the reactor auxiliary and supporting systems
- Core components
- Reactor core physics
- Overview of the secondary system
- I&C concept

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Prerequisites

Practical experience in a power plant is desirable, but no specific knowledge of nuclear power plants is required.

Note

Participants: 6 to 12 persons

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Basics of Nuclear Power Plant Commissioning
Course Number: B510

Target Group

This training course is aimed at all supplier and sub-supplier personnel who are involved in commissioning tasks at the nuclear power plant construction site. The main objective is therefore to familiarize all course participants with the overall structure and objectives of the commissioning program and present specific examples of the ongoing project.

Duration: 1 day

Location: Erlangen

Language: English

Learning Objectives

The course participants acquire an overview of a commissioning organization and their areas of responsibility, as well as an overview of the commissioning documentation. Furthermore, they receive increased awareness of safety aspects and error prevention tools during commissioning including the correct forwarding of commissioning questions/clarification needs to responsible personnel.

Contents

- Basics of nuclear power plant commissioning
  - Nuclear physics of nuclear power plant design
  - Fundamentals of operation of main nuclear power plant systems
  - Commissioning phases and scopes, from initial system tests to PTO (= Provisional Take Over)
- Introduction to nuclear safety issues during commissioning
  - Safety rules and regulations to be applied
  - Duties and responsibilities during commissioning tasks
- Methods, instruments and tools for commissioning
  - Permit to work concept
  - Commissioning management tools regarding "Materials, Tests, Permits to Work“
- Documentation: What is a commissioning procedure?
  - Applicability and significance of the commissioning documentation structure
  - Significance of the commissioning process, procedure and reports

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Prerequisites

Basic knowledge of pressurized water reactors is advantageous.

Note

Participants: 6 to 12 persons.
This course is only available in English.

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Nuclear Safety Basic Course
Course Number: B880.1D

Target Group

Project managers, project engineers, and technical personnel of nuclear power plants.

Duration: 1 day

Location: Erlangen

Language:

German / English

Learning Objectives

The participants acquire an overview of the overall safety concept of a nuclear power plant.

Contents

The following topics will be covered in detail:

- Safety objectives
- Codes and standards
- Safety issues during the design phase
- PSA during design
- Safety issues during the construction phase
- Safety issues during operation of plant
- Safety improvements/assessment
- Nuclear safety: application examples

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Prerequisites

Several years of practical experience in technical work or attendance of one of the introductory courses are advantageous.

Note

Participants: 6 to 12 persons

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Auxiliary and Emergency Power Supply in PWR
Course Number: L245

Target Group

Utility employees who needs an overview about the auxiliary and emergency power supply in a KWU PWR.

Duration: 1 day
Location: Karlstein
Language: German
English on request

Learning Objectives

The participants receive an overview about auxiliary and emergency power supply in a nuclear power plant. Beside the main components generator, transformer and generator breaker the emergency diesel generator sets inclusive their auxiliary systems are known. Furthermore the requirements of auxiliary and emergency power supply according KTA are explained. The participants know the differences in design of auxiliary and emergency power supply in the German pressurized water reactors and the EPR.

Contents

The following topics will be covered in detail:
Tasks of auxiliary and emergency power supply
- Design criteria
- Building concept

General layout of auxiliary power supply
- Requirements according KTA
- Supply possibilities
- Main components
- Power transmission variants of German PWR

General layout of emergency power supply
- Requirements according KTA
- Emergency power network 1 (design and supply possibilities)
- Emergency power network 2 (design and supply possibilities)
- Uninterruptable power supply

General design of auxiliary and emergency power supply in the EPR

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Prerequisites

General knowledge about the design and the function of a nuclear power plant.

Note

Participants: 6 to 12 persons

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Overview of Turbine Control: KWU PWR (Electric and Hydraulic)
Course Number: L247

Target Group

Engineers, technicians and foremen as well as clerks of a nuclear power plant (also qualified personnel of authorities as well as expert organizations).

Duration: 2 days
Location: Karlstein
Language: German
English on request

Learning Objectives

Participants will receive an overview of the electrical and hydraulic turbine and bypass control systems of a nuclear power plant.

Reference: Konvoi / Pre-Konvoi

Contents

The following will be covered, specifically:

- Tasks of the closed-loop controls on the turbine
- Electric turbine control
- Turbine stress evaluator
- Hydraulic turbine control
- Bypass control system
- Gland steam regulator
- Operation, operating cases

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Prerequisites

Practical experience in a power plant is desired, but no specific knowledge regarding nuclear power plants is required.

Note

Participants: 6 to 12 persons

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Structure and Mode of Operation of the Turbo - generator
Course Number: L248

Target Group

Engineers, technicians and foremen as well as clerks of a nuclear power plant (also qualified personnel of authorities as well as expert organizations).

Duration: 1 day
Location: Karlstein
Language: German
English on request

Learning Objectives

Participants will receive an overview of the design and mode of operation of a turbo- generator.

Contents

The following will be covered in detail:

- Mode of operation of the generator
- Cooling types and series
- Main components of the generator
- Auxiliary systems of the generator
- Measuring and monitoring equipment
- Excitation equipment

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Prerequisites

Practical experience in a power plant is desired, but no specific knowledge regarding nuclear power plants is required.

Note

Participants: 6 to 12 persons

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PWR Advanced Courses

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PWR Plant Course
Course Number: B311D

Target Group

The course provides training for future shift personnel and prepares them for reactor operator or shift supervisor examinations on technical plant issues of PWR.

Duration: 25 weeks

Location: Karlstein

Language: German

English on request

Learning Objectives

The course participants acquire knowledge on the design of their designated nuclear power plant. In the first and second parts of the course, the key primary- and secondary side systems are presented, focusing on their design, function, I&C, operation principle and accident behavior. In the third part of the course, knowledge of the nuclear operation practices and the operation and accident behavior of the overall plant is consolidated from the following perspective: physics/thermal hydraulics, reactor safety I&C, plant dynamic analyses and the operating manual.

Contents

Part 1: Primary circuit

- Components in a nuclear power plant: filter, pumps, compressors, fans, auxiliary valves and heat exchangers
- Overview of the overall plant, power plant identification system, reactor coolant system and pressurizing system including the main components of the nuclear auxiliary and supporting systems (from volume control systems to component drainage and venting), as well as the residual heat removal chain
- Treatment and storage of radioactive liquid waste / activity flow in a nuclear power plant / discharge of radioactive substances into the environment/ structural radiation protection, accessibility of plant, chemical conditioning modes

Part 2: Secondary circuit: Secondary systems, power transmission and auxiliary power supply

- All secondary side systems from the main steam system to the power transmission system, auxiliary power supply / emergency power supply, DC supply

Part 3: Nuclear operation, reactor I&C, operational transients and accidents

- From reactivity behavior till to cooldown from the remote shutdown station

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Prerequisites

Good power plant knowledge or prior participation in the B211D PWR introductory course.

Note

Participants: 6 to 12 people
Scope and Duration can be adapted to the needs of the customer
Every part of the course is concluded with a written examination.

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Basics of Beyond-Design-Basis Accidents (Severe Accidents)
Course Number: B850

Target Group

Experts and employees from the following areas: development, commissioning and maintenance for systems used for mitigation and management of beyond-design-basis accidents in nuclear power plants.

Duration: 1 day

Location: Erlangen

Language: English

Learning Objectives

The main objective of this course it to familiarize course participants with the basics of initiating events and technological solutions for beyond-design-basis accidents including lessons learned from severe accidents Three Miles Island, Chernobyl and Fukushima.

Contents

- From TMI-2 to Fukushima – lessons learned
- Introduction to beyond-design-basis accidents
  - International and national classification
  - Basics of beyond-design-basis accidents
- Specific design for Severe Accidents (SA)
  - Design requirements for SA systems - features of GEN III+
  - Diversity, redundancy and independence – preventive measures for SA
- Radiation protection during beyond-design-basis accidents
  - Phenomenology and radiological acceptance criteria
  - Specific measures for management or mitigation of the effects of SA
- Methods for preventing and mitigating SA
  - Scenarios and analysis methods
  - Level 1 and level 2 probabilistic safety analysis
  - Plant management during beyond-design-basis accidents

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Prerequisites

Advanced plant knowledge, several years of relevant work experience in a PWR nuclear power plant, are advantageous.

Note

Participants: 6 to 12 persons

PWR Operating Personnel Training on the Behavior of a PWR in Incident Situations
Course Number: B895D

Target Group

Shift personnel and specialists, crisis management teams and process engineering teams.

Duration: 1 to 5 days

Location: Erlangen

Language: English

Learning Objectives

The training course is based on the results tests performed by Framatome with the integral test facility PKL for investigating PWR behaviors under accidental conditions. The course focuses in particular on accidental scenarios, for which simulators cannot sufficiently reproduce the thermal-hydraulic phenomena (e.g. failure of RHRS at ¾ loop operation)
The reactor behavior is shown on a detailed animation (simultaneous graphical display of more than 1500 measuring points showing the chronological change of the plants conditions) and are explained in detail..

Contents

- Standard or Tailor made training based on customer's type of plant and operating procedure based on following scenarios:
- Large break / small break / intermediate break loss-of coolant accident
- Steam generator tube rupture
- Main steam line breaks
- Station blackout, loss of feed-water transients
- Failure of RHRS from cold shutdown condition
- Efficiency of accident management (bleed-and-feed)procedures
- Systematic studies on thermal-hydraulic phenomena:
    - Single- / two-phase natural circulation
    - Reflux condenser conditions with / without non condensable gases

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Prerequisites

Several years of relevant work experience in the PWR operations or system engineering.

Note

Participants: 6 to 10 persons

The training can also be held in suitable training rooms at the customer's facility

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PWR Expert Courses

PWR Thermal Hydraulics
Course Number: B813D

Target Group

Senior shift personnel and specialists, especially for physics, I&C and process engineering.

Duration: 1 day
Location: Karlstein
Language: German
English on request

Learning Objectives

The training course is based on Framatome‘ s long-standing operational experience in operational feedback evaluation, performing design calculations, and test results obtained at the PKL facility in Erlangen and the KATHY test facility in Karlstein.

Contents

- Thermal and calorific state variables
- State changes of water with application examples from nuclear power plants
- Condensation processes in a PWR
- Water hammer
- Flow dynamics in nuclear power plants
- Single- and two-phase flow
- Natural circulation
- Heat transfer mechanisms
- Heat removal in forced and natural circulation
- Applications in normal operation of nuclear power plants
  - Heat transfer in reactor core, critical heat flux, film boiling
  - Secondary side heat removal, part-load diagram
  - Thermal hydraulic monitoring of the core

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Prerequisites

Several years of relevant work experience in the PWR engineering and participation in the B211D PWR introductory course are advantageous.

Note

Participants: 6 to 12 persons

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PWR Nuclear Instrumentation
Course Number: B840D

Target Group

Engineers and technicians form the I&C or process engineering / physics area, as well as commissioning experts and shift personnel.

Duration: 3 days
Location: Karlstein
Language: German
English on request

Learning Objectives

This course gives the participants a detailed overview of the nuclear instrumentation in a PWR plant. The following topics are discussed: principles and design of the instrumentation systems, I&C processing of the obtained neutron flux signals in limitation and reactor protection functions.

Reference: Konvoi / Pre-Konvoi

Contents

- General possibilities for neutron flux measurement
- Neutron flux excore instrumentation system
  - Mechanical design
  - Principle of neutron flux measurement
  - Source, intermediate and power range
  - Coordination of the measuring ranges, reactor protection
  - Calibration
- Physical monitoring of fuel loading
- Neutron flux incore instrumentation system
  - Mechanical design of the PDD system (PDD = Power Distribution Detector)
  - Power distribution detectors
  - Monitoring of power density distribution
  - Aeroball system
  - Nuclear process computer, POWERTRAX
  - Processing of PDD signals in limitation functions

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Prerequisites

Several years of relevant work experience in a PWR nuclear power plant. Furthermore, participation in the B211D PWR introductory course is recommended.

Note

Participants: 6 to 12 persons

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PWR Nuclear Operation Practice
Course Number: B841D

Target Group

Senior shift personnel and specialist personnel especially in physics, I&C and process engineering.

Duration: 2 days
Location: Karlstein
Language: German
English on request

Learning Objectives

This course provides the participants with an in-depth understanding of the operational behavior of a plant from the physics standpoint. The participants consolidate their knowledge of reactor physics and use this on concrete examples from plant operation. After completing the course, participants can independently carry out qualitative and predictive estimations.

Reference: Konvoi / Pre-Konvoi

Contents

- Neutron-physics basics
- Reactor core
- Loading of a reactor
- Neutron kinetics in subcritical and critical zero-power reactors
- Criticality monitoring during fuel loading and startup
- Reactivity coefficients and effects
  - Boron
  - Fuel temperature
  - Coolant temperature
  - Control rods
  - Xenon
- Power density distribution / xenon oscillations
- Neutron flux noise

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Prerequisites

Several years of relevant work experience in PWR engineering.

Note

Participants: 6 to 12 persons

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PWR Know-why Courses

Other specific PWR/BWR know-why courses are available on request.

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Phenomena, Time Sequences, Effectiveness of Measures, Accident Instrumentation
Course Number: B875.27D

Target Group

Employees of the Systems Engineering Department and responsible shift personnel (engineers, technicians, foremen, clerks). Note: Depending on the group of participants, the main topics will be adapted.

Duration: 2 days
Location: Erlangen
Language: German
English on request

Learning Objectives

instrumentation available in the nuclear power plants in the event of the assumed based on experimental results from the primary circuit test facility (PKL), trainees will gain in-depth knowledge of the thermohydraulic processes in pressurized water reactors during accident situations. Basic thermohydraulic phenomena and interrelationships as well as time sequences of accident scenarios are illustrated with the use of films (process visualization). Another important objective is to demonstrate the effectiveness of counter-measures provided in the operating manual/emergency procedures manual and the significance of the accidents.

Contents

- Overview of the PKL experimental project
- Operational transients and design-basis accidents
- Loss of coolant (LOCA) failures with small leaks in the primary circuit
- Beyond design-basis events and plant-internal emergency/accident management measures
- Events in non-power operation (failure aftercooling)

Due to the broad spectrum of topics, ranging from situations under emergency power conditions to small leakage incidents and station blackout to events in non-power operation, the training will be subdivided into 2 days.

The learning content is based on the manufacturer's many years of experience in system design with regard to plant installation as well as various retrofits and is also based on the experience evaluation of various PWR plants.

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Prerequisites

Several years of relevant professional experience in a PWR power plant

Note

Participants: 6 to 12 persons

The training can also be held in suitable training rooms at the customer's facility.

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Criticality Safety in the Fuel Pool and Failure of the Spent Fuel Pool Cooling System
Course Number: B875.28D

Target Group

Physicists and engineers from the field of reactor physics or fuel assemblies as well as responsible shift personnel. Depending on the group of participants, the main topics will be adapted.

Duration: 1 day
Location: Erlangen
Language: German
English on request

Learning Objectives

The participants will be given the necessary understanding of the detection methods and the underlying physics. The beyond-design-basis event "prolonged failure of the fuel pool cooling system" is discussed and emergency measures for controlling this event are presented. In addition to the pressure and temperature build-up in the containment, in the event of a failure of the fuel pool cooling system, the cooling capability of partially exposed fuel pools and the local dose rate on the pool floor are considered. The emergency diesel, the mobile shortened cooling chain and the temperature limitation in the fuel pool by pressure relief of the containment are presented as a concepts of plant-internal emergency measures.

Contents

- Basics - criticality in LWR systems
- Tools - Monte Carlo simulations
- Criticality safety demonstrations for fuel pools
- Burn-off credit in criticality safety proofs
- Failure of the fuel pool cooling system
  - Existing possibilities for cooling the fuel pool.
  - Pressure and temperature build-up in the containment in the event of failure of the fuel pool cooling system
  - Cooling capability of partially exposed fuel assemblies
  - Local dose rate on the basin floor
  - Concept for emergency measures in case of complete failure of the fuel pool cooling system

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Prerequisites

Several years of relevant work experience in a PWR power plant.

Note

Participants: 6 to 12 persons

The training can also be held in suitable training rooms at the customer's facility.

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Experience Evaluations of Diesel and Emergency Power Supply
Course Number: B875.30D

Target Group

Employees of the electrical and systems engineering department (for diesel engines) and responsible shift personnel (engineers, technicians, foremen, clerks). The main topics will be adapted according to the group of participants.

Duration: 1 day
Location: Karlstein
Language: German
English on request

Learning Objectives

Important events in auxiliary and emergency power supplies, and in diesel generator sets and their auxiliary systems which could result in partial or complete loss of power supply to the reactor system. The main objective of this course is the discussion of different significant events in the design of auxiliary and the emergency power supply systems. Employees in electrical and systems engineering (for diesel engines) receive information on the significance of various technical solutions with regard to failure modes.

Contents

- Concept auxiliary and emergency power supplies and for emergency diesel (including load shedding to house load, offsite power transfer).
- Controls, auxiliary systems, priority equipment protection
- Diesel pest, climatic conditions (summer diesel).
- Forsmark event (cascading failure on the electrical side)
- Incidents in auxiliary and emergency power supply
- Incidents in reactor protection systems (e.g. passive fault in KKP2)
- Incidents in emergency diesel generator sets
- ANGRA 2 event: Emergency power failure after blackout of the Brazilian power grid
- Reliability in long-term operation

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Requirements

Relevant work experience in a PWR nuclear power plant

Note

Participants: 6 to 12 people

The training can also be held in suitable training rooms at the customer's facility

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Experience Evaluations of the Residual Heat Removal Chain of the Fuel Pool
Course Number: B875.31D

Target Group

Employees of the Systems Engineering Department and responsible shift personnel (engineers, technicians, foremen, clerks). Depending on the group of participants, the main topics will be adapted.

Duration: 1 day
Location: Erlangen
Language: German
English on request

Learning Objectives

The participants receive background knowledge regarding the heat removal chain - based on VGB Powertech specifications. This is intended to provide employees in systems engineering with the necessary understanding of the existing technical solutions. For the operating personnel, background information for determining operating modes is of particular importance, which is also addressed in this course.

Contents

- Historical development, basic design requirements
- Safety-related functions, error concept
- Process engineering requirements and design
- High river water temperatures
- Emergency cooling standby, fuel pool heat removal / cleaning.
- Aftercooling control, Barsebeäck 2 event 1992
- Driving modes for backwashing the sump strainers according to LOCA
- Angra 2, flooding annulus from fuel pool, Biblis unit A - event
- Failure of the primary heat sink
- Potential causes of primary heat sink failure, superimposed events.
- Blockage of inlet structures due to foreign material - jellyfish/ - ice formation.
- Formation of biological foreign bodies in power plant systems - mussels
- Impairment of heat transfer at heat exchangers - fouling
- Retention and cleaning of foreign substances
- MIC - Microbiologically induced corrosion / component cooling systems
- Evaluation of cooling water systems, damage to piping in auxiliary cooling water systems, specific know-why issues.

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Requirements

Relevant work experience in a PWR nuclear power plant

Note

Participants: 6 to 12 people

The training can also be held in suitable training rooms at the customer's facility

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Lessons Learned from Fukushima
Course Number: B875.32D

Target Group

Responsible shift personnel (engineers, technicians, foremen, clerks), especially members of the plant emergency staff. Depending on the group of participants, the main topics will be adapted.

Duration: 1 day

Location: Erlangen

Language: German

English on request

Learning Objectives

The aim of this course is to provide participants with a technical understanding of the accident sequence at Fukushima Daiichi, as well as to highlight the key lessons learned from the accident. Based on this, the main European as well as national regulatory consequences will be presented.

Contents

- Introduction
- Fukushima
  - Plant design
  - Triggering event
  - Accident sequence block 1
  - Accident sequence block 3
  - Accident sequence block 2
  - Accident sequence block 4
  - Accident treatment problems
  - Direct findings
- Effects on Germany/EU
  - European Stress Test
  - PWR1300 - SBO with D2 network failure as a controlled scenario.
  - PWR1300 - SBO + LUHS as postulated uncontrolled scenario.
  - Robustness analysis
  - Derivation of additional emergency measures

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Requirements

Relevant work experience in a PWR nuclear power plant

Note

Participants: 6 to 12 people

The training can also be held in suitable training rooms at the customer's facility

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EPR Reactors

EPR Reactors

Introductory, advanced and simulator courses for international EPR plants, ongoing project-related courses for modernization and new-build projects.

Introductory Courses

Introductory courses provide a standard EPR plant overview of systems and process engineering features. An overview of the following topics is given: overview of nuclear, safety, auxiliary and secondary side systems, as well as operational and safety-related I&C, nuclear physics and electrical engineering basics.

Advanced Courses

EPR advanced courses are plant- and technology-specific and provide detailed information on systems and on process related aspects of operational and safety-related I&C. These courses cover the following topics in detail: overview of nuclear, safety, auxiliary and secondary side systems including a review of basic design requirements, as well as operational and safety-related I&C, nuclear physics and electrical engineering basics.

Simulator Courses

These courses make use of an EPR Training Simulator. The simulator courses offers theoretical knowledge with emphasize on practical exercises covering operational aspects from normal plant operation towards abnormal, accidents and beyond design cases.

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EPR Short Introductory Course
Course Number: B252EPR

Target Group

Engineers, technicians and experts who want to become acquainted with the EPR design.

Duration: 5 days

Location: Erlangen

Language:

German / English

Learning Objectives

This course gives an overview of the design philosophy of an EPR plant and introduces its main systems. The system layout, main components and operation are discussed.

Contents

The course covers the following topics in detail:

- EPR history, design philosophy, main plant data
- EPR overview, main systems and their location
- Introduction to nuclear physics
- Overview of the primary circuits
  - Layout and main components, Instrumentation
- Overview of the auxiliary systems
  - Composition and function of the auxiliary systems
- Overview of the safety-related systems
  - Composition and function of the residual heat removal chain
- Secondary circuit – overview
  - Heat transfer and main components of the secondary circuit
- Electrical systems, I&C and reactor control
  - Main components of electrical power supply and I&C
- Overview EPR safety concept
  - Main safeguard systems and severe accident mitigation

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Prerequisites

No specific knowledge of nuclear power plants is required.

Note

Participants: 6 to 12 persons
The training materials are available in English only

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EPR Advanced Course
Course Number: B257EPR

Target Group

Engineers and technicians involved in the design, construction, commissioning or maintenance phases of new-build projects.

Duration: 10 days

Location: Erlangen

Language:

German / English

Learning Objectives

After completion of this course, the participants will be able to better recognize how the EPR systems work together based on the design principles. This course gives an overview of the EPR design, taking into account safety and design principles relevant throughout all stages of the EPR lifecycle: design, planning, construction, commissioning, periodic testing and maintenance.

Contents

The course covers the following topics in detail:

- Safety requirements, rules and regulations, and design principles of the EPR
- Reactor coolant system
  - Main components of the reactor coolant system with design principles
- Primary-to-secondary-side heat transfer, operating principle of the steam generator
- Overview of the water-steam cycle with main components
- Auxiliary power supply and emergency power concept
  - Design principles and power supply requirements
- Overview of the I&C architecture, design requirements of the operational and safety I&C
- Accident control using safety systems
  - Design of the safety injection systems for loss-of-coolant accidents (LOCA)
- Reactor auxiliary systems
  - Design and operation of the Chemical and Volume Control System (CVCS), coolant purification, coolant treatment and storage systems, and gaseous waste processing system
  - Concept of storage and handling of radioactive waste

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Prerequisites

Participation in EPR short introductory course (B252EPR) or comparable knowledge is required and 6 months of work experience.

Note

Participants: 6 to 12 persons
The training materials are available in English only

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Basics of Plant Operation and Transients with the EPR Training Simulator
Course Number: B460EPR

Target Group

All engineering personnel involved in design, installation, commissioning, operation and maintenance of an EPR-type Pressurized Water Reactor (PWR).

Duration: 4 days

Location: Karlstein

Language: English

Learning Objectives

The main objective of this training course is to familiarize the participants with the operation of a nuclear power plant under normal, abnormal and accident conditions using a real-life user interface HMI platform under real-time conditions. The course consists of theoretical parts (T = theory) followed by practical training and exercises on the EPR Engineering Simulator (SIM = simulator) with the OM690 MMI interface.

Contents

- Introduction to nuclear power plant operation
  - Overview of operational and safety targets (T module)
  - Methods and tools of operation (operating manuals, MMI system, Technical Specifications) (T/SIM module)
  - Introduction to simulator operation (SIM module)
- Introduction to normal plant operation
  - Systems overview and plant conditions (T module)
  - Load ramps (T/SIM module)
- Strategies during abnormal plant operation
  - Definitions and methods (concept of turbine trip, partial turbine trip and reactor trip (T module)
  - Examples and exercises regarding abnormal operation transients (SIM module)
- Accident management
  - Definitions and methods (safety systems, lines of defense, diversity) (T module)
  - Examples and exercises regarding accidents (SIM module)
  - Overview of beyond-design-basis accidents (T/SIM module)

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Prerequisites

Basics knowledge of EPR Plant Operation and Technology is required. Relevant work experience in a PWR nuclear power plant or participation in the B252EPR or B257EPR Technology courses are advantageous.

Note

Participants: 4 to 8 persons
This training course is available in English only

2

I&C Courses

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Safety-related I&C TELEPERM XS

Safety-related I&C TELEPERM XS

Training in all topic areas relating to design, engineering and maintenance of safety-related I&C with TELEPERM XS. For an optimal training course, we offer standard courses and customer-specific training session for all target groups. At our Training Center in Karlstein, you can deepen and consolidate the theoretical knowledge obtained in lesson through practical exercises.

Introductory Courses

- Pages 45 to 54 -

The introductory courses give an overview of TELEPERM XS basics in the following areas: system architecture, hardware, specific features of engineering and depending on the focus, also maintenance and V & V.

Advanced Courses

- Pages 55 to 60 -

These courses are topic and tool based. They provide deepened knowledge on hardware and software components in the important topic areas of TELEPERM XS engineering, test (V & V) and commissioning and operation (servicing and maintenance).

Expert Courses

- Pages 61 to 63 -

Expert courses build on the knowledge acquired in the advanced courses on system administration and maintenance.

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TXS Introductory Courses

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TELEPERM XS - Fundamentals including Practicals
Course Number: L231.1

Target Group

Personnel involved in I&C project processing, including management staff and personnel in sales/marketing of I&C equipment and licensing authorities.

Duration: 5 days

Location: Karlstein

Language:

German / English

Learning Objectives

Upon successful completion of this course, course participants will be able to:

- Explain the architecture and function computers of a TELEPERM XS I&C system
- State the basic functions of the hardware modules
- Explain TELEPERM XS system properties and fault detection
- State the TELEPERM XS engineering process in detail
- Design simple databases
- Work with the TELEPERM XS SPACE tools
- Interpret the diagnostic possibilities

Contents

This course covers the overall concept of the safety I&C system platform TELEPERM XS (TXS). It gives an overview of TELEPERM XS products, the engineering process (including V&V and SPACE tools) and operation (handling, maintenance). The most important TELEPERM XS hardware and software components, as well as their system properties, are presented. TELEPERM XS safety architecture and maintenance/diagnostic applications are explained.

The following topics are covered in detail and their practical applications are stated:

- Basics of the TELEPERM XS system (architecture, function computers, Hardware 2nd generation and system properties)
- Engineering process including function specifications and V&V management
- Specification of a data base with hardware & software plans (detailed engineering)
- Engineering tools (SPACE)
- Introduction to diagnostics and any tools required
- Overview of the Test Bay and ERBUS
- Practical exercises, demonstrations and seminar tasks

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Prerequisites

General knowledge of automation technology for safety systems in nuclear power plants. General IT skills and knowledge of Linux are required.

Note

This course will be the basic for the following courses:
TELEPERM XS-Maint, TXS-QDS, TXS-HW2G, TXS SIVAT, TXS-ADMIN
Participants: 6 to 8 persons

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TELEPERM XS - Fundamentals Compact
Course Number: L231.2

Target Group

Personnel involved in I&C project processing, including management staff and personnel in sales/marketing of I&C equipment and licensing authorities.

Duration: 3 days

Location: Karlstein

Language:

German / English

Learning Objectives

Upon successful completion of this course, course participants will be able to:

- Explain the architecture, function computers, TELEPERM XS hardware modules, as well as the system properties of a TELEPERM XS system
- State the TELEPERM XS engineering process
- Design part of a database
- Perform some tasks with TELEPERM XS SPACE tools
- Identify and explain maintenance and diagnostic possibilities

Contents

This course essentially covers the same topics as course L231.1, but in a condensed form. Course participants receive an overview of TELEPERM XS products, the engineering process and the process of operation and maintenance. They learn about selected hard- and software components, as well as system properties. Safety I&C architectures and maintenance/diagnostic applications are presented.

The course covers the following topics in detail:

- Basics of the TELEPERM XS system (function computer with architecture, hardware and software with system properties)
- Engineering process (incl. V&V and function specifications)
- Important function specifications as part of a database (network plan)
- SPACE tools which are a part of the engineering process
- Introduction to maintenance and the necessary tools
- Simple demonstrations and exercises are included

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Prerequisites

General knowledge of automation technology for safety systems in nuclear power plants.

Note

Participants: 6 to 8 persons

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TELEPERM XS - Fundamentals Overview
Course Number: L231.3

Target Group

Personnel involved in I&C project processing, including management staff and personnel in sales/marketing of I&C equipment and licensing authorities.

Duration: 2 days

Location: Karlstein

Language:

German / English

Learning Objectives

Upon successful completion of this course, course participants will be able to:

- Explain the basic concepts of the TELEPERM XS system platform
- Identify the relevant hardware modules of the system platform
- State the system properties of the digital I&C system and the possibilities for fault detection
- Explain the basic principles of engineering and maintenance

Contents

This course gives a condensed overview of TELEPERM XS products.
The participants learn about individual components of the TELEPERM XS system. This includes hardware and software components, and an initial insight into the system properties, the engineering process and maintenance.

The course covers the following topics in detail:

- Basics of the TELEPERM XS system
- TELEPERM XS function computer and system architectures
- Overview of the most important hardware/software modules and TELEPERM XS system properties
- Overview of the engineering process
- Introduction into maintenance
- Presentation of additional demonstrations

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Prerequisites

General knowledge of automation technology for safety systems in nuclear power plants.

Note

Participants: 6 to 8 persons

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TELEPERM XS - Maintenance HW2G/SMS (5 days)
Course Number: L531.1

Target Group

I&C maintenance personnel and I&C testing and commissioning personnel.

Duration: 5 days

Location: Karlstein

Language:

German / English

Learning Objectives

Upon successful completion of this course, course participants will be able to:

- State basics of the TELEPERM XS system (e.g. architecture, hardware and system properties)
- Explain the concept and mechanism of TELEPERM XS maintenance and its use in the context of maintenance service
- Carry out the following activities independently: system error analysis, diagnosis,
  troubleshooting, and recovering

Contents

The course is based on TELEPERM XS Hardware 2nd generation and the core software version 3.3 x with SMS and GSM as diagnostic tools. After a short introduction to the basics and their plant specific application, the course focuses on the functionality, application and use of the Service Unit, which is the main tool for fault detection and diagnosis. The theoretical knowledge is consolidated in practical exercises.

The essential elements of the course are:

- System Basics (function computer and system architectures, Hardware 2nd generation and system properties)
- The basics of maintenance
- Fault analysis and diagnosis using the Service Unit and the TELEPERM XS cabinet
- Procedure and handling of module replacement
- Loading software and verify loaded software and parameter settings

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Prerequisites

Basic knowledge of control and digital automation systems, basic knowledge of TELEPERM XS by preference. Previous attendance of a TELEPERM XS basics or engineering course is desirable but not essential.

Note

Participants: 6 to 8 persons

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TELEPERM XS - Maintenance HW2G/DIMAS (5 days)
Course Number: L531.2

Target Group

I&C maintenance personnel, including I&C testing and commissioning personnel.

Duration: 5 days

Location: Karlstein

Language:

German / English

Learning Objectives

Upon successful completion of this course, course participants will be able to:

- Explain the TELEPERM XS basics, architecture and system properties
- Explain the concept and mechanism of TELEPERM XS maintenance
- Use the different DIMAS clients on the Service Unit (SU) for TELEPERM XS diagnosis and maintenance
- Monitor the TELEPERM XS system, modify parameters and verify parameter changes
- Explain module exchange procedure and module settings

Contents

The course is based on TELEPERM XS Hardware 2nd generation and the 2nd generation of TELEPERM XS core software version ≥ 3.6.x with DIMAS clients. The course starts with a short introduction to TELEPERM XS basics and their plant specific applications. The main focus is on function, application and handling of the TELEPERM XS Service Unit as a tool for diagnosis and troubleshooting in TELEPERM XS systems. Further topics are diagnosis at the cabinet and methods and handling for module replacement.

The course covers the following topics in detail:

- TELEPERM XS basics (system architecture and system properties; HW2G; SPACE function diagram editor FDE)
- Basics of TELEPERM XS maintenance with the Service Unit (DIMAS introduction, DIMAS clients, operating modes and parameterization)
- TELEPERM XS diagnostics at the cabinet (identification/repair of errors at the cabinet; replace or set modules)
- Practical exercises

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Prerequisites

General IT skills, basic I&C knowledge, as well as knowledge of digital automation systems. Basic knowledge of TELEPERM XS (e.g. previous attendance of a TELEPERM XS basics or engineering course) is desirable.

Note

Participants: 6 to 8 persons

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TELEPERM XS - Maintenance HW2G/DIMAS (10 days)
Course Number: L531.5

Target Group

This course is intended for I&C maintenance personnel and I&C testing and commissioning personnel.

Duration: 10 days

Location: Karlstein

Language:

German / English

Learning Objectives

Upon successful completion of this course, participants will be able to:

- Explain TELEPERM XS basics, architecture and system properties
- Explain concept and mechanisms of TELEPERM XS maintenance
- Independently diagnosis and troubleshoot the TELEPERM XS system (HW faults/SW errors) with aid of the TXS Service Unit and rectify the faults/errors
- Identify hardware faults, replace faulted modules, change parameters, save changes and load software
- Document the troubleshooting

Contents

The course covers all aspects of TELEPERM XS maintenance for carrying out independent diagnosis, troubleshooting, parametrization, module replacement and commissioning of a real system. The theoretical knowledge is consolidated in practical exercises.

The course covers the following topics in detail:

- Basics of the TELEPERM XS system (system architecture, HW2G, system properties, engineering, coding concept)
- Diagnosis using the TELEPERM XS Service Unit (monitoring and annunciation concept, SU, DIMAS and DIMAS clients, introduction, operating modes and parameterization)
- Diagnosis and maintenance at the training cabinet (independent diagnostic analysis with the Service Unit and the training cabinet, module replacement, commissioning of the system in accordance to the actual TXS documentation)
- Technical documentation of faulted modules in accordance with the return procedure

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Prerequisites

Basic knowledge of I&C and experience in digital automation systems. TELEPERM XS basic knowledge (e.g. attendance of TXS basics or engineering). Knowledge of Python is required. Generic IT skills and Linux knowledge are necessary.

Note

Participants: 6 to 8 persons

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TELEPERM XS - Engineering Detailed Design
Course Number: L631.1

Target Group

This course is intended for external/ internal engineers (I&C, IT, QM) and training personnel, qualification personnel.

Duration: 5 days

Location: Karlstein

Language:

German / English

Learning Objectives

Upon successful completion of this course, participants will be able to:

- Name the basic properties of TELEPERM XS I&C systems with respect to system design, hardware and software
- Explain the most important steps and tools of the engineering process
- State the tools required for engineering of TELEPERM XS I&C systems
- List the tasks and contents of I&C requirement and system specification
- Use the engineering tools for code generation, verification & validation, testing and documentation of TELEPERM XS application software

Contents

In addition to a short introduction to TELEPERM XS basics, the course covers the most important elements of the TXS engineering process. It gives an overview of how to generate an I&C system specification, detailed engineering of software coding, as well as the verification and validation of the individual process steps using the associated engineering tools (SPACE).
The validation tool SIVAT is also examined closely. The theoretical knowledge is consolidated in practical exercises.

The course covers the following topics in detail:

- TELEPERM XS basics
- TELEPERM XS engineering process (overview)
- Overview of I&C requirement and system specification (levels 1-4)
- SPACE function diagram editor FDE in detail
- SPACE database design (identification coding concept, tips and rules)
- Generation of an I&C system specification (hardware, software)
- Application software coding using all SPACE tools
- Validation of the application software using SIVAT

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Prerequisites

Basic knowledge of I&C and experience in digital automation systems, and basic knowledge of TELEPERM XS (such as the prior attendance of a TELEPERM XS basic course). General IT skills are desirable.

Note

Participants: 6 to 8 persons

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TELEPERM XS - Engineering Detailed Design - Compact
Course Number: L631.2

Target Group

I&C engineering personnel, as well as I&C test and commissioning personnel who have already take part in an engineering course.

Duration: 3 days

Location: Karlstein

Language:

German / English

Learning Objectives

Upon successful completion of this course, participants will be able to:

- Recall the basic knowledge of TELEPERM XS I&C systems with regard to system architecture, hardware and software
- Revise important steps and content of engineering processes
- Explain the tools which are necessary for engineering of TELEPERM XS I&C systems
- Use the engineering tools for creation, verification & validation and documentation of TELEPERM XS software independently

Contents

This course is a refresher course for all persons who have previously participated in an engineering course. The most important features and topics of TELEPERM XS engineering are revised in a compact manner.
This course is based on the L631.1 TELEPERM XS engineering course. The participants perform practical exercises to expand and consolidate their knowledge.
The following topics are covered in detail:

- TELEPERM XS basics (function computer, system architectures and properties)
- TELEPERM XS engineering process (concept)
- SPACE function diagram editor (FDE)
- Create an I&C system specification (hardware and software)
- User software coding using all SPACE tools
- Practical exercises

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Prerequisites

TELEPERM XS system knowledge with regard to architecture, hardware and software.

Note

Participants: 6 to 8 persons.

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TELEPERM XS - SPECIAL BASIC/ENG/MAINT/OPERATION
Course Number: L831.1

Target Group

Customers and staff members with an interest in acquiring comprehensive knowledge of the TELEPERM XS safety I&C system in a very short time.

Duration: 2x 5 days

Location: Karlstein

Language:

German / English

Learning Objectives

Upon successful completion of this course, course participants will be able to:

- State the basic properties of TELEPERM XS I&C systems with respect to system design, hardware and software
- Explain the most important system architectures of the safety I&C
- Describe fundamental features of the TELEPERM XS Hardware 2nd generation and to understand the engineering process
- Work with the SPACE engineering tools, carry out system diagnostics and to know and understand the features of the Test Bay

Contents

The course provides a detailed insight into all engineering activities for the TELEPERM XS system platform. The participants consolidate their knowledge in practical exercises.

Part 1:

- TELEPERM XS basics (function computer, TELEPERM XS engineering process, system architecture, Hardware 2nd generation, system properties)
- Introduction to I&C function specifications (levels 1-4)
- SPACE function diagram editor FDE, design rules, and practical applications of SPACE tools
- Exercises relating to hardware and software specification and application code generation

Part 2:

- TELEPERM XS maintenance (monitoring concept, diagnosis at the cabinet, introduction and diagnosis using Service Unit and DIMAS, module replacement and settings, loading and verifying software, and practical exercises concerning troubleshooting)
- SIVAT introduction
- TELEPERM XS Test Bay (introduction, Test Bay structure, test program, procedure and performance)

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Prerequisites

Basic knowledge of I&C and of digital automation systems and generic IT skills are desirable.

Note

This is a two part course, each part lasting 5 days.

Participants: 6 to 8 persons

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TXS Advanced Courses

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TELEPERM XS - Hardware 2nd Generation
Course Number: L350.1

Target Group

This course is intended for I&C engineering personnel, technical project managers, I&C testing, commissioning and maintenance personnel.

Duration: 3 days

Location: Karlstein

Language:

German / English

Learning Objectives

Upon successful completion of this course, participants will be able to:

- State the basics of TELEPERM XS Hardware 2nd generation
- Explain the connection between the mechanical structure of a cabinet and the conceptual requirements regarding the assembly of a TXS cabinet
- Explain the structure and the operating principle of cabinet modules and cabinet connection techniques
- Plan the hardware in the engineering process (e.g. cabinet arrangement diagram)

Contents

The course begins with an introduction and an overview of TELEPERM XS Hardware 2nd generation. The actual properties of the TELEPERM XS Hardware 2nd generation are presented, including the new range of TELEPERM XS modules. The course provides information on purpose, structure and function of the modules, including cabinet power supply, circuit breaker and monitoring. A cabinet arrangement diagram will be designed. Thereby the relationship between engineering specification and the functionality of the cabinet modules are mediated. This includes coding concept, standards, cabinet structure, mechanics, etc.

The course covers the following topics in detail:

- Basics of TELEPERM XS hardware components
- Purpose, structure and operating principle of modules
- Non code-relevant analog and binary modules
- Code-relevant modules (computer, communication, input and output modules)
- Creation of a cabinet arrangement diagram using VISIO
- Consolidation of instruction material in theoretical and practical exercises

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Prerequisites

Basic knowledge of I&C and digital automation systems,
basic knowledge of TELEPERM XS (introductory course). Generic IT skills (VISIO) are advantageous.

Note

Participants: 6 to 8 persons

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TELEPERM XS - SIVAT - V1.8 Verification and Validation
Course Number: L632.1

Target Group

This course is intended for I&C engineering personnel and personnel who want to acquire comprehensive knowledge in this field.

Duration: 2 days

Location: Karlstein

Language:

German / English

Learning Objectives

Upon successful completion of this course, course participants will be able to:

- Explain the field of application of SIVAT in the engineering process and the concept and function of SIVAT (1.8)
- Generate a simulation code by using SIVAT (1.8)
- Create simulation scripts
- Test and validate I&C functions

Contents

This course covers the function of SIVAT (SImulation based Validation Tool V1.8) and the generation of SIVAT code. In addition, the course participants will learn how to work with SIVAT. They will learn to test and validate the engineered I&C functions in the software environment of SIVAT by using scripts.

The course covers the following topics in detail:

- The purpose, principle and requirements of the SIVAT simulation
- Generation of simulation code for an exemplary project of simulator structure
- Graphical user interface of SIVAT
- Work with simulation scripts
- Signal manipulations and simulation of malfunctions
- Practical exercises

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Prerequisites

A basic background in I&C and in electrical engineering.
Experience with digital automation systems is desirable.
TXS basic knowledge (such as participation in a TELEPERM XS fundamentals course) is mandatory, prior attendance of a TXS engineering course desirable.

Note

Participants: 6 to 8 persons

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TELEPERM XS - SIVAT - V3.6 Verification and Validation
Course Number: L632.2

Target Group

This course is intended for I&C engineering personnel and personnel who want to acquire comprehensive knowledge in this field.

Duration: 3 days

Location: Karlstein

Language:

German / English

Learning Objectives

Upon successful completion of this course, participants will be able to:

- Explain the purpose, principles and requirements of a SIVAT simulation
- Use the SIVAT user interface (3.6.x)
- Explain and use the SIVAT Client API (3.6.x)
- Explain the interaction between DIMAS and SIVAT objects
- Specify and explain SIVAT test cases and their functions
- Create SIVAT test scripts using Python

Contents

This course covers the function of SIVAT (SImulation based VAlidation Tool), version 3.6.x. Course participants learn about the functions of SIVAT and how it is used in the engineering process. Subsequently, the SIVAT programming interface available in Python is explained using practical examples.
Based on this, the participants validate an I&C function using the SIVAT code by developing their own SIVAT/Python test script.

The course covers the following topics in detail, both theoretically and practically:

- Scope of SIVAT applications during the engineering process
- The concept and functionality of SIVAT
- Script design with help of SIVAT Client API
- Interaction between SIVAT and DIMAS
- Simulation of malfunctions
- Automation of test cases
- Integration of external models

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Prerequisites

Knowledge of Python is mandatory. Attendance of DIMAS course L540.1 is also recommended. Basic knowledge of I&C and experience in digital automation systems are desirable. IT and Linux knowledge is necessary.

Note

Participants: 6 to 8 persons

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TELEPERM XS - QDS Applications
Course Number: L635.1

Target Group

This course is intended for I&C personnel, electrical, simulator training instructors and power plant operators.

Duration: 2 days

Location: Karlstein

Language: English

German on request

Learning Objectives

Upon successful completion of this course, course participants will be able to:

- Explain the concept and mechanisms of QDS
- Use QDS, including connection to a TELEPERM XS system
- Use engineering tools such as Qt Designer, QDS_Gen, QDS_HMI and QDS_SU
- Monitor the connected TELEPERM XS system
- Modify settings
- Download application to QDS hardware

Contents

The course provides an overview of the concept and function of the TELEPERM XS QDS (Qualified Display System). The participants learn how a QDS system is integrated into TELEPERM XS and design a QDS application using the QDS tools QDS_Gen, Qt Designer, QDS_HMI and QDS_SU. At the end of the training course, they are able to download their applications onto the QDS hardware which is connected to a TELEPERM XS training cabinet.

The course covers the following topics in detail:

- Hardware architecture
- Software architecture
- QDS in SPACE
- Engineering tools
- Designing displays
- Connection of signals and HMI
- QDS Service Unit
- Practical exercises

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Prerequisites

Basic TELEPERM XS knowledge (e.g. previous attendance of a TELEPERM XS fundamentals course or TELEPERM XS engineering course) is desirable. IT skills and Linux knowledge are necessary.

Note

Participants: 6 to 8 persons

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TELEPERM XS - Test Bay and ERBUS
Course Number: L720.1

Target Group

This course is intended for customers and internal staff with an interest in acquiring comprehensive knowledge of the TELEPERM XS safety I&C system in the Test Bay.

Duration: 5 days

Location: Karlstein

Language: English

German on request

Learning Objectives

Upon successful completion of this course, course participants will be able to:

- State the Test Bay (concept and setup, test programs and test procedures)
- Define the general concepts and setup of ERBUS (test system)
- Explain the function of the ERBUS Simulation Control Unit (SCU), the Test Machine (TM) and the Test Equipment Controller (TEC)
- Use ERBUS software tools and the ERBUS Client API
- Carry out safety I&C functional tests using Python based ERBUS scripts

Contents

The training course covers the following topics: Test Bay, platform, required resources, test plan, test procedure, test performance and conditions. The main focus of the course is the ERBUS test system (SCU with SW version 3.6.x and TM SW version 2.0.0), which is the main test system in the Test Bay. Knowledge about the ERBUS hardware and software is provided. I&C functional tests are discussed and carried out. Theoretical and practical exercises allow the participants to consolidate their knowledge.

The course covers the following topics in theory and practice:

- The concept and setup of the Test Bay
- The Test Bay equipment
- Test programs, procedures and performance
- Introduction to ERBUS, Test Machine and the Simulation Control Unit
- Hardware connections
- ERBUS and DIMAS in communication with the ERBUS-Shell
- Testing of signal connections and I&C functionality using Python scripts

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Prerequisites

Knowledge of Python is compulsory. Basic knowledge of I&C and experience in digital automation systems is desirable. TELEPERM XS and Linux basic knowledge is advantageous but not essential.

Note

Participants: 6 to 8 persons

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TELEPERM XS Expert Courses

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TELEPERM XS – DIMAS Fundamentals
Course Number: L540.1

Target Group

This course is intended for I&C engineering, V&V, commissioning and maintenance personnel.

Duration: 3 days

Location: Karlstein

Language:

German / English

Learning Objectives

Upon successful completion of this course, participants will be able to:

- Explain the interaction between DIMAS and the online system
- Explain the basic functionalities of a Service Unit and CPU operating modes
- Perform parameter changes
- Explain DIMAS clients and their functionalities
- Develop DIMAS scripts using DIMAS Client API
- Implement Graphical Service Interfaces with the aid of dimasQt

Contents

This course covers DIMAS functionality, version 3.6.x.
The functionality and the possible applications of the Service Unit and DIMAS (including clients) are explained and consolidated on with the aid of practical exercises. The Python programming interface is explained on the basis of the DIMAS Client API with reference to practical examples. The programing skills acquired are used to perform the first steps in the development of a Graphical Service Interface.

The course covers the following topics in detail:

- Introduction to the Service Unit and DIMAS
- Principle of the TELEPERM XS service concept
- Functionality of DIMAS clients (TXSStatus, FDView, EventLog, DIMAS-Shell)
- Introduction to the DIMAS Client API (dimasUtil)
- Introduction to operating modes and parameterization
- Development of scripts and Graphical Service Interfaces
- Practical exercises

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Prerequisites

Knowledge of Python is mandatory. Basic knowledge of I&C and experience in digital automation systems, as well as basic TELEPERM XS knowledge are advantageous but not essential. General IT skills and Linux knowledge are necessary.

Note

Participants: 6 to 8 persons

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TELEPERM XS – SYSADMIN-Linux Fundamentals
Course Number: L633.1

Target Group

This course is intended for technicians responsible for the administration of a TELEPERM XS system.

Duration: 2 days

Location: Karlstein

Language:

German / English

Learning Objectives

Upon successful completion of this course, participants will be able to:

- State the basic functions of the TELEPERM XS Service Unit (SU)
- Configure TELEPERM XS hardware and software for a SU
- Install and test TELEPERM XS Core Software
- Perform basic administrative tasks on a TELEPERM XS Service Unit

Contents

The course is based on the Linux operating system and TELEPERM XS software version, higher than 3.3. using the TELEPERM XS Service Unit. The participants learn how to set up and administrate users, groups and printers. Furthermore, they learn how to install TELEPERM XS software packages. YaST system administration is also dealt with. Handling of the KDE desktop environment will be consolidated. The participants consolidate the acquired knowledge in practical exercises.

The course covers the following topics in detail:

- Overview of TELEPERM XS and Linux
- Installation of SUSE Linux Enterprise Server
- KDE and Linux concepts
- Creation of TELEPERM XS users and groups
- Installation of TELEPERM XS software packages
- Configuration and administration of TELEPERM XS
- YaST Control Center
- Practical exercises, including testing of the installation

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Prerequisites

Basic knowledge of I&C and computer technology, and of the Linux operating system are mandatory. Experience with digital automation systems is desirable. Basic knowledge of TELEPERM XS is mandatory.

Note

Participants: 6 to 8 persons

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Hard-Wired Programmed I&C

Hard-Wired Programmed I&C

Training in all topic areas relating to design, function, engineering operation- and monitoring of hard-wired programmed I&C systems used in KWU power plants.

Introductory Courses

- Pages 65 to 69 -

The introductory courses give an overview of I&C concepts, open-loop control systems, closed-loop control systems, equipment protection systems and operation- and monitoring concepts.

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ISKAMATIC

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ISKAMATIC B Process Control System
Course Number: L223

Target Group

Utility employees from engineering, operation and maintenance departments, and employees of licensing authorities.

Duration: 5 days
Location: Karlstein
Language: German
English on request

Learning Objectives

The participants are familiarized with the ISKAMATIC B control system and its applications. After the course, the participants will be able to:

- Perform engineering
- Operate ISKAMATIC B
- Interpret signal patterns
- detect malfunctions
- work with the documentation.

Contents

- Overview of the ISKAMATIC B process control system
- System data and design
- Logic symbols
- Design of the standard cabinet (ISKAMATIC E)
- Documentation (function diagrams and circuit diagrams)
- Alarm annunciation concept
- Binary signal conditioning and limit signal generation
- Control interface
- Undervoltage monitoring
- Fault isolation and priority control
- Sub-loop control
- Subgroup control
- Group control
- Protective logics
- Practical exercises on modules

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Prerequisites

General basic knowledge of signal conditioning, control technology and logic functions.

Note

Participants: 6 to 8 persons

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ISKAMATIC B Process Control System - Functional Group Control
Course Number: L223.1

Target Group

Employees of energy supply companies from the areas of planning, operation and maintenance, and from licensing authorities.

Duration: 2 days
Location: Karlstein
Language: German
English on request

Learning Objectives

The participants will be familiarized with the ISKAMATIC B process control system and its possible applications. At the beginning of the training, the participants will receive a brief overview of the special features of the various ISKAMATIC B modules that are necessary for understanding a functional group control. The main focus of the training is the application in the area of functional group control.

Contents

- ISKAMATIC B introduction and overview
- Principle of functional group control
- Structure and function of functional group control
- Assemblies for functional group control
  - Manual-automatic mode selector HA11
  - Control coordinator module FK11
  - Sequential control step monitoring FÜ11
  - Step module FS11
  - Timer modules FZ11/FZ12
  - Assemblies FA11/FA12
  - Assembly FG11
- Documentation
- Practical exercises
  - Setup of a subgroup control with ISKAMATIC B exercise cases
  - Commissioning of a subgroup control with the AW01 exercise model

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Prerequisites

Participation in training L223 Process Control System ISKAMATIC B

Note:

Participants: 6 to 8 persons

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Instrumentation & Control Concept - Analog Operational I&C
Course Number: L244

Target Group

Employees involved in the use of conventional I&C technology in nuclear power plants.

Duration: 2 days
Location: Karlstein
Language: German
English on request

Learning Objectives

The participants will be familiarized with the use of conventional I&C technology in the nuclear power plant. After successful course participation, the participants will be able to:

- Explain the use of the ISKAMATIC and TELEPERM C conventional I&C technology systems using the main condensate system as an example.
- Describe the operating and monitoring concept of the ISKAMATIC and TELEPERM C conventional I&C technology systems

Contents

The course covers the following topics in detail:

- I&C technology concept
- Overview of the main condensate system
- Measured value acquisition and measured value processing
  - Binary signal conditioning
  - Analog signal conditioning
- Controls using the example of the main condensate system
  - Group control
  - Subgroup control
  - Subloop control
  - Drive control
  - Priority control
- Unit protection using the example of the main condensate system
- Closed-loop controls using the example of the main condensate system
- Reporting concept

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Prerequisites

General knowledge about automation technology in nuclear power plants

Note

Participants: 6 to 8 persons

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Instrumentation & Control Technology Concept in the KWU PWR (BELT and SILT)
Course Number: L246

Target group

Employees involved in the use of conventional I&C technology in nuclear power plants.

Duration: 1 day
Location: Karlstein
Language: German
English on request

Learning objectives

The participants will get an overview of the architecture of the operational I&C technology and the safety I&C technology in a KWU PWR. In addition to process engineering backgrounds, the participants will learn about the equipment technology used and how it works.

Contents

Introduction:
- I&C technology concept
- Open-loop control
- Closed-loop control
- Reactor protection
- Reporting concept

Operational I&C technology
- Analog and binary signal conditioning
- Drive controls
- Subgroup controls
- Subloop controls
- Group controls
- Unit protection
- Closed-loop controls in the KWU PWR

Safety I&C technology
- Rules and regulations
- Reactor limitation and reactor protection

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Prerequisites

General basic knowledge of automation technology in nuclear power plants.

Note:

Participants: 6 to 8 persons

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4

Virtual Courses

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Virtual Course Offer Technology Courses

Technology Courses

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PWR Introductory Course (Shortened)
Course Number: B226D_VC

Target Group

Engineers, technicians and foremen as well as clerks of a nuclear power plant, who want to get an insight into the overall plant.

Duration: 5 days
Location: Virtual
Language: German
English on request

Learning Objectives

The course participants will gain an insight into the structure and operation of a nuclear power plant (PWR). Furthermore, the operational interaction of the systems involved is addressed.
The documents used are based on the Philippsburg 2 plant (pre-convoy).

Contents

- General principles and introduction to the overall system
- Design, function and operation of the primary circuit
- Core components
- Physics of the reactor core
- Overview of reactor auxiliary systems and reactor ancillary systems
- Overview of secondary circuit
- I&C technology concept

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Prerequisites

Practical experience in a power plant is an advantage, but no special knowledge regarding nuclear power plants is required.

Note: Participants: 6 to 8 persons

Please note that you need to install "Skype for Business" on your PC.
The PC should be equipped with a microphone and loudspeaker.
Alternatively, a headset can also be used.

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Nuclear Safety Basic Course
Course Number: B880.1D_VC

Target Group

Project managers/engineers, as well as technical officers for nuclear power plants.

Duration: 1 day
Location: Virtual
Language:
German / English

Learning Objectives

The course participants will receive an overview of the overriding safety concept of a nuclear power plant using the example of an EPR.

Contents

The following will be specifically addressed:

- Module 1: Safety objectives and safety regulations and regulators.
- Module 2: Basic principles and the tiered approach to safety; safety in design.
- Module 3: The role of PSA in design and safety during construction and erection.
- Module 4: Safety during operation and nuclear safety - technical solutions.

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Prerequisites

Several years of practical experience as a technical clerk or participation in an introductory course is an advantage.

Note: Participants: 6 to 8 persons

Please note that you need to install "Skype for Business" on your PC.
The PC should be equipped with a microphone and loudspeaker.
Alternatively, a headset can also be used.

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Experience Evaluations: Diesel and Emergency Power Supply
Course Number: B875.30D_VC

Target Group

Employees of the Electrical and Systems Engineering Department (here regarding diesel) and responsible shift personnel (engineers, technicians, foremen, clerks).

Duration: 2 days
2 x 3.5 h
Location: Virtual
Language: German
English on request

Learning Objectives

Significant incidents in the auxiliary power supply and the emergency power system as well as the diesel generators and their auxiliary systems, which can lead to partial or even total loss of power supply for the reactor plant. The focus of this course is the discussion of various significant incidents on the design of the auxiliary power supply and the emergency power system. Employees in electrical and system engineering (here regarding diesel) are taught the significance of various technical solutions with regard to their failure behavior.

Contents

- Concept auxiliary and emergency power supplies and for emergency diesel (including load shedding to house load, offsite power transfer).
- Controls, auxiliary systems, priority equipment protection
- Diesel pest, climatic conditions (summer diesel).
- Forsmark event (cascading failure on the electrical side)
- Incidents in auxiliary and emergency power supply
- Incidents in reactor protection systems (e.g. passive fault in KKP2)
- Incidents in emergency diesel generator sets
- ANGRA 2 event: Emergency power failure after blackout of the Brazilian power grid
- Reliability in long-term operation

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Prerequisites

Relevant work experience in a PWR power plant.

Note: Participants: 6 to 8 persons

Please note that you need to install "Skype for Business" on your PC.
The PC should be equipped with a microphone and loudspeaker.
Alternatively, a headset can also be used.

Auxiliary and Emergency Power Supply in the KWU PWR
Course Number: L245_VC

Target Group

Individuals who want to get an overview of the power supply to a PWR.

Duration: 2 days
2 x 3.5 h
Location: Virtual
Language: German
English on request

Learning Objectives

The participants will get an overview of the auxiliary and emergency power supply of a nuclear power plant. In addition to the main components: generator, transformer and generator breaker; the participants will also learn about the diesel generator sets and their auxiliary systems.
Furthermore, the requirements for auxiliary and emergency power supply according to KTA are explained. The participants will learn about the differences in the design of the auxiliary and emergency power supply in the German pressurized water reactors and in the EPR.

Contents

The following topics will be covered in detail:
Tasks of auxiliary and emergency power supply
- Design criteria
- Building concept

General layout of auxiliary power supply
- Requirements according KTA
- Supply possibilities
- Main components
- Power transmission variants of German PWR

General layout of emergency power supply
- Requirements according KTA
- Emergency power network 1 (design and supply possibilities)
- Emergency power network 2 (design and supply possibilities)
- Uninterruptable power supply

General design of auxiliary and emergency power supply in the EPR

Contact

+49 (0)9131 900 34567
training@framatome.com
www.framatome.com/de/active-future-development-your-success-is-our-goal/

Prerequisites

General basic knowledge about the structure of a nuclear power plant.

Note: Participants: 6 to 12 persons

Please note that you need to install "Skype for Business" on your PC.
The PC should be equipped with a microphone and loudspeaker.
Alternatively, a headset can also be used.

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Turbine Control Overview KWU PWR (Electric and Hydraulic)
Course Number: L247_VC

Target Group

Engineers, technicians and foremen as well as clerks of a nuclear power plant (also qualified personnel of authorities as well as expert organizations).

Duration: 4 days
4 x 3.5 h
Location: Virtual
Language: German
English on request

Learning Objectives

Participants will get an overview of the electrical and hydraulic turbine and diversion control of a nuclear power plant.

Reference: convoy / pre-convoy

Contents

The following will be covered, specifically:

- Tasks of the closed-loop controls on the turbine
- Electric turbine control
- Turbine stress evaluator
- Hydraulic turbine control
- Bypass control system
- Gland steam regulator
- Operation, operating cases

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Prerequisites

Practical experience in a power plant is desired, but no specific knowledge regarding nuclear power plants is required.

Note: Participants: 6 to 12 people

Please note that you need to install "Skype for Business" on your PC.
The PC should be equipped with a microphone and loudspeaker.
Alternatively, a headset can also be used.

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Structure and Mode of Operation of the Turbo - generator
Course Number: L248_VC

Target Group

Engineers, technicians and foremen as well as clerks of a nuclear power plant (also qualified personnel of authorities as well as expert organizations).

Duration: 2 days
2 x 3.5 h
Location: Virtual
Language: German
English on request

Learning Objectives

Participants will receive an overview of the turbo-generator's design and mode of operation.

Contents

The following will be covered in detail:

- Mode of operation of the generator
- Cooling types and series
- Main components of the generator
- Auxiliary systems of the generator
- Measuring and monitoring equipment
- Excitation equipment

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Prerequisites

Hands -on experience in a power plant is desired, but no specific knowledge regarding nuclear power plants is required.

Note: Participants: 6 to 12 people

Please note that you need to install "Skype for Business" on your PC.
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Virtual Course Offer: I&C Technology

I&C Technology Courses

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TELEPERM XS - Fundamentals Overview
Course Number: L231.3_VC

Target Group

Personnel involved in the management of I&C projects, including management, sales/marketing, and permitting authorities.

Duration: 5 days
3 h per day
Location: Virtual
Language: German
English on request

Learning Objectives

After successful course participation, participants will be able to:
- Explain basic concepts of the TELEPERM XS system platform
- Identify relevant hardware modules of the system platform
- Describe the system properties of a digital I&C system and its fault detection capabilities in principle
- Explain the basic principles of engineering and maintenance

Contents

This **VIRTUAL TRAINING** is divided into 5 modules (days) of 3 hours per day:

The following topics will be covered and practically applied in detail:
- Module 1: Program, Introduction of TELEPERM XS and System Architecture
- Module 2: Hardware 2nd Generation
- Module 3: System properties, TELEPERM XS overview of manuals
- Module 4: Engineering Process (Overview) and SPACE Overview (FDE & Tools)
- Module 5: Diagnostics and Troubleshooting, Service Device and Test Field (Overview)

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Prerequisites

General knowledge of automation technology for safety systems in nuclear power plants.

Note: Participants: 6 to 8 persons (also bookable by the module).

Please note that you need to install "Skype for Business" on your PC.
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Alternatively, a headset can also be used.

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I&C Technology Concept in the KWU PWR (BELT and SILT)
Course Number: L246_VC

Target Group

Employees involved in the use of conventional I&C technology in nuclear power plants.

Duration: 2 days
2 x 3.5 h
Location: Virtual
Language: German
English on request

Learning Objectives

The participants will get an overview of the architecture of the operational I&C technology and the safety I&C technology in a KWU PWR. In addition to process engineering backgrounds, the participants will learn about the equipment technology used and how it works.

Contents

Introduction:
- I&C technology concept
- Open-loop control
- Closed-loop control
- Reactor protection
- Reporting concept

Operational I&C technology
- Analog and binary signal conditioning
- Drive controls
- Subgroup controls
- Subloop controls
- Group controls
- Unit protection
- Closed-loop controls in the KWU PWR

Safety I&C technology
- Rules and regulations
- Reactor limitation and reactor protection

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Prerequisites

General basic knowledge of automation technology in nuclear power plants.

Note: Participants: 6 to 8 persons

Please note that you need to install "Skype for Business" on your PC.
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Alternatively, a headset can also be used.

Organization and Information

Do you have specific requirements for a training course?

We can put together a tailor-made course. Please contact us and we will be happy to advise you.

Course Options

Progress checks can be arranged on completion of almost all courses. Terms are available on request

Our website offers tips on how to plan your trip and find accommodation nearby.

Online offer / booking

Find out more about our current course catalog with dates and prices under:

http://www.framatome.com/de/active-future-development-your-success-is-our-goal/

To apply, please use our online booking form or contact us by email.

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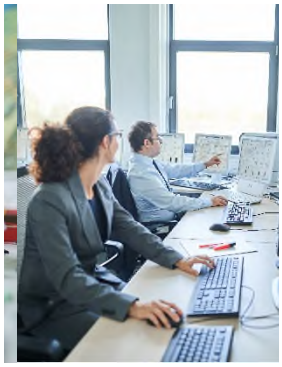

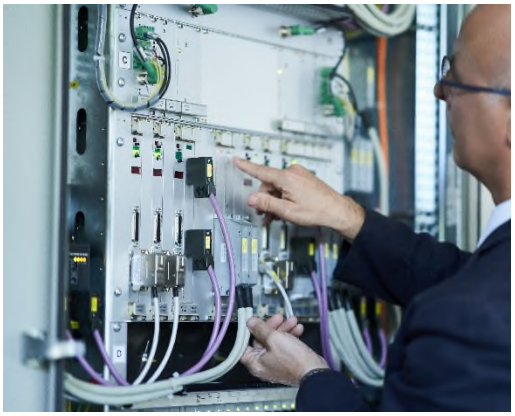

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Training Center

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Framatome is an international leader in nuclear energy recognized for its digital and value added solutions for the global nuclear fleet. With worldwide expertise and a proven track record for reliability and performance, the company designs, services and installs components, fuel, and instrumentation and control systems for nuclear power plants.
Its more than 18,000 employees work every day to help Framatome's customers supply ever cleaner, safer and more economical low-carbon energy.
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