

TRUST. WELL EARNED.

Customer Training

Share our expertise



Customer Training – Share our expertise

Courses can be combined to ensure you get optimum value and are tailor-made to suit users requirements in a relaxed atmosphere.

Power Management Systems

- PRISMIC® PMS

Excitation Controllers

- A50/A50N
- A3100
- A32
- A12
- A10
- A30/A30M/MICRO
- MAVR
- TDAVR

General Courses

- Synchronising
- Rotor Ground Fault Monitoring and Detection (RF/R10/R20)

Generators

- DAX 2 Pole
- DG 4 Pole

Develop your knowledge of BRUSH products in the most effective way by attending our specialist courses.

We offer a wide range of courses relevant to generator, power management, excitation control and synchronizer systems. This includes current and 'heritage' products that are still in active service.

A hands-on, practical involvement is a strong feature and being away from the normal working environment allows for maximum information to be retained.

Our UK training facility is located in Loughborough, England and offers training on the full BRUSH product range.

The school is equipped with working examples of BRUSH power management products, excitation controllers and a power plant simulator.



Course Objectives

By the end of the course, attendees will be able to:

- Identify all the major components of a BRUSH generator and their function.
- Understand the generator capability diagram and the role of a BRUSH excitation system in keeping operation within safe limits.
- Perform troubleshooting on the generators and associated BRUSH equipment.
- Interpret BRUSH layout and schematic drawings for equipment installed on-site. Attendees will all receive copies of relevant BRUSH drawings and manuals.
- Recommend maintenance schedules and inspections for BRUSH machines.
- Understand the full BRUSH product range and how our services can add value.

Who should attend?

These courses are for managers, engineers, operators, maintenance and other personnel requiring specialist knowledge and/or familiarisation with the BRUSH Product range, specifically in the areas of operation and maintenance.

It would also benefit University and College students studying Electrical Power and Power Control Systems.



Machine, PMS and Excitation Controller courses will each cover:

Power Systems Introduction

- Principles of AC generation
- Faraday's Law of electromagnetic induction
- Three-phase generator
- Generator excitation control systems
- 'Hands on' generator control using BRUSH training generators

Power generation systems

- Prime mover/generator
- Generator operation
- Automatic voltage control
- Parallel operation
- Governor droop
- Generator output
- System operation

Generator synchronizing

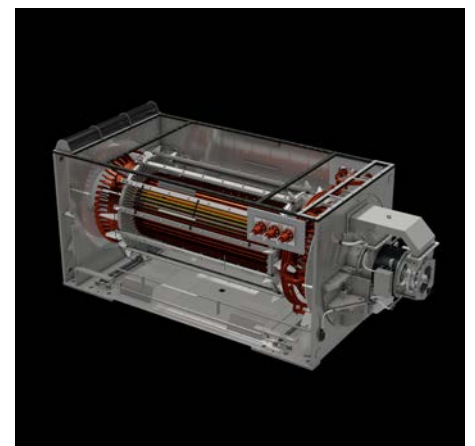
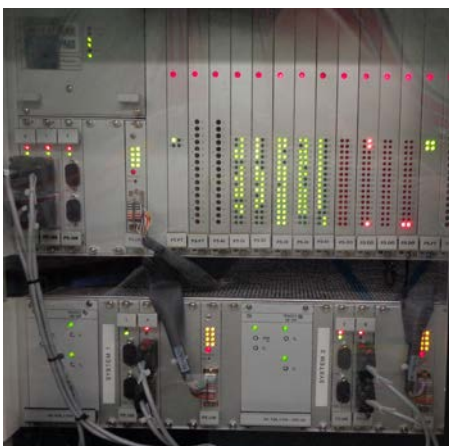
- Introduction
- DC and AC generators
- Synchronizing AC generators
- Lamp synchronizing and synchroscope
- Synchronizing at the switchboard/control panel
- Automatic and check synchronizing
- Closure onto dead busbars
- 'Hands on' experience synchronizing multiple generators and grid/islanded control

Capability diagrams

- Introduction
- Stator current
- Power output
- Rotor current
- Stability of the rotor
- Dynamic Temperature limitation
- Use of the capability diagram

Generator protection systems - overview

- Introduction
- Traditional and modern protection systems



Training courses – Power Management Systems:

PRISMIC® PMS power Management systems



Course covers the following:

Introduction

Applications

Features

Set management

- Starting and stopping of sets
- Duty selection and hours run
- Alarms – fail to synchronize, incorrect duty
- Minimum sets to run
- Critical sets
- Large motor starting
- Split bus operation

Load shedding (HMI systems)

- Modes of operation

Spinning reserve

- Solid bus system
- Detached system

Fault finding

- Rack and external input faults
- External faults
- PRISMIC® generated alarms
- Fault scenarios
- Interpretation of event logs and trends

System maintenance

- General maintenance
- Routine checks
- Calibration of generators/grid feeders
- Calibration of load feeders
- Load inhibits
- Spinning reserve alarms
- Set management maintenance
- Load shedding maintenance
- Printers and HMI systems
- Records

Close

- Certificate presentation
- Course appraisal
- Question/answer session

This course will be delivered as required for all PMS versions.

We are flexible with course content and times to suit customer requirements.

Training courses – Excitation Controllers:

PRISMIC® A50/A50N Excitation Controller



Course covers the following:

Principles

Introduction

Applications

Hardware:

- Panel arrangements
- Independent main and standby controllers
- Power semiconductor circuits
- Connections
- I/O

Features:

- Transfer between main and standby control modes
- Voltage limiters and monitors
- Flux limiters
- Excitation current limiters
- Stator current limiter
- Soft start facility
- Operating modes

- Communications – HMI set-up
- Diode failure alarm
- Event recorder
- Analogue trends
- PSS
- Synchronising
- Rotor ground fault monitoring

Operation

- QC48 records system
- Using the HMI

Fault finding

- Panel lamps
- HMI event logging
- Fuses
- BRUSH support contacts
- Spares
- Maintenance

Close

- Certificate presentation
- Course appraisal
- Question/answer session

We are flexible with course content and times to suit customer requirements.

Training courses – Excitation Controllers: **PRISMIC® A3100** **Excitation Controller**



Course covers the following:

Principles

Introduction

Applications

- Hardware:
- Rack
- Independent Hot Swapable Main and Standby control Cards
- Independent Hot Swapable Main and Standby Power Rectifier cards
- I/O
- Active high/low cards

Features

- Smooth transfer between main and standby control modes
- Voltage limiters and monitors
- Flux limiters and monitors
- Excitation current limiters and monitors
- Soft start facility
- Operating modes
- Communications - HMI set-up
- Diode failure alarm
- Step response

- Extendable I/O for additional signals not available as standard
- LED Status indications
- Automatic and Check Synchronising
- Power System Stabilizer
- Rotor Earth Fault Monitoring
- VAr sharing
- Isochronous
- Analogue trends

Operation

- 'Hands on' operation controlling a generator
- QC48 records system

- Using the HMI
- Overview of commissioning procedure

Fault finding

- BRUSH support contacts
- Spares
- Maintenance

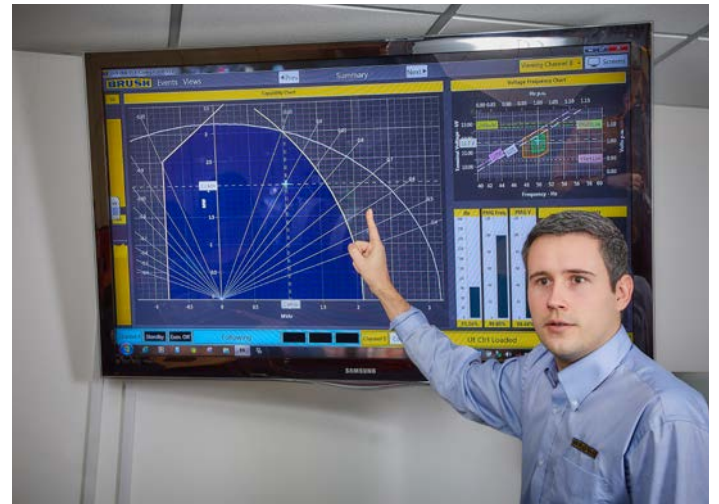
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- Certificate presentation
- Course appraisal
- Question/answer session

We are flexible with course content and times to suit customer requirements.

Training courses – Excitation Controllers:

PRISMIC® A32 Excitation Controller



Course covers the following:

Principles

Introduction

Applications

Hardware:

- Rack
- Independent main and standby controllers
- Connections
- I/O

Features:

- Transfer between main and standby control modes
- Voltage limiters and monitors
- Flux limiters and monitors
- Excitation current limiters and monitors
- Soft start facility
- Operating modes
- Communications – HMI set-up

- Diode failure alarm
- Panel mounted display
- Step response
- Analogue trends

Operation

- 'Hands on' operation controlling a generator
- QC48 records system
- Using the HMI
- Overview of commissioning procedure

Fault finding

- BRUSH support contacts
- Spares
- Maintenance

Close

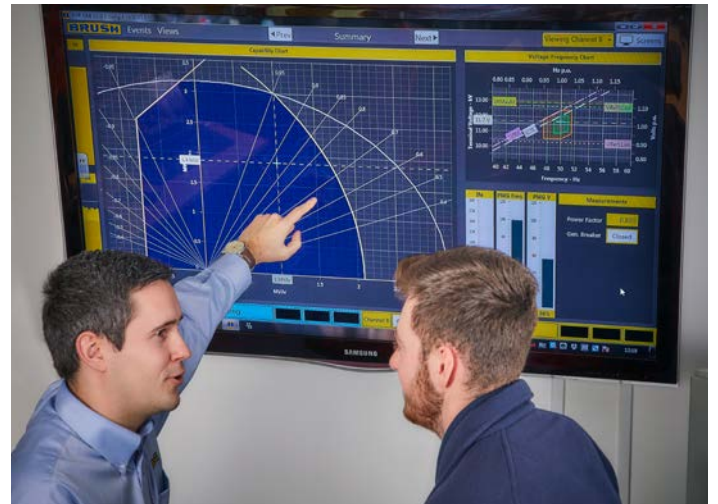
- Certificate presentation
- Course appraisal
- Question/answer session

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Training courses – Excitation Controllers:

PRISMIC® A12

Excitation Controller



Course covers the following:

Principles

Introduction

Applications

Hardware:

- Description of plate mounted equipment
- Independent main and standby controllers
- Power semiconductor circuits
- Overview of A12 controllers
- Connections
- Serial channels

Features:

- Transfer between main and standby control modes
- Voltage limiters and monitors
- Flux limiters and monitors
- Excitation current limiters and monitors
- Soft start facility
- Step response
- Operating modes
- Communications – HMI set-up

- Diode failure alarm
- Optional operator console
- Analogue trends
- Data logging/event recording
- Analogue outputs

Operation

- 'Hands on' operation controlling a generator
- QC48 records system
- Using the HMI
- Overview of commissioning procedure

Fault finding

- Alarm status
- Exchanging hardware
- HMI
- Fuses
- BRUSH support contacts
- Spares
- Maintenance

Close

- Certificate presentation
- Course appraisal
- Question/answer session

We are flexible with course content and times to suit customer requirements.

Training courses – Excitation Controllers:

PRISMIC® A10 Excitation Controller



Course covers the following:

Principles

Introduction

Applications

Hardware:

- Single and twin plate variants
- Independent 'A' and 'B' controllers
- Power semiconductor circuits
- Control cards
- Connections
- I/O

Features:

- Transfer between 'A' and 'B' control modes
- Voltage limiters and monitors
- Flux limiters and monitors
- Excitation current limiters and monitors
- Soft start facility
- Operating modes
- Communications – HMI set-up
- Diode failure alarm
- Event recorder

Operation

- 'Hands on' operation controlling a generator
- QC48 records system
- Using the HMI
- Overview of commissioning procedure

Fault finding

- Front panel LEDs
- HMI event logging
- Fuses
- BRUSH support contacts
- Spares
- Maintenance

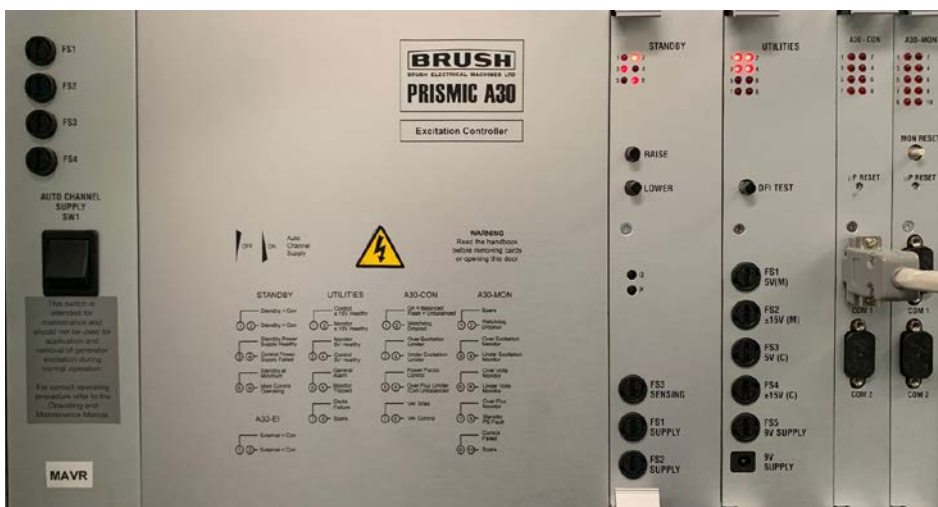
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- Certificate presentation
- Course appraisal
- Question/answer session

We are flexible with course content and times to suit customer requirements.

Training courses – Excitation Controllers:

PRISMIC® A30/A30-M/MICRO Excitation Controller



Course covers the following:

Principles

Introduction

Applications

Hardware:

- Rack
- Independent main and standby controllers
- Power semiconductor circuits
- Control cards
- Connections
- I/O

Features:

- Transfer between main and standby control modes
- Voltage limiters and monitors
- Flux limiters and monitors
- Excitation current limiters and monitors
- Soft start facility
- Operating modes
- Communications – HMI set-up
- Diode failure alarm
- Event recorder

Operation

- ‘Hands on’ operation controlling a generator
- QC48 records system
- Using the HMI
- Overview of commissioning procedure

Fault finding

- Front panel LEDs
- HMI event logging
- Fuses
- BRUSH support contacts
- Spares
- Maintenance

Close

- Certificate presentation
- Course appraisal
- Question/answer session

We are flexible with course content and times to suit customer requirements.

Training courses – Excitation Controllers:

PRISMIC® MAVR Excitation Controller



Course covers the following:

Principles

Introduction

Applications

Hardware:

- Rack
- Independent auto and manual controllers
- Power semiconductor circuits
- Control cards
- Connections
- I/O

Features:

- Manual regulator
- Soft start
- Automatic control
- Transfer between manual and auto control
- The null balance meter
- Field current limit
- Field suppression
- Stability controls
- Over-flux limiting
- Diode failure indication
- Over and under excitation limiters and monitors

- Power factor control
- VAr shedding
- A complete guide through the customer's handbook including schemes

Operation

- 'Hands on' operation controlling a generator
- Overview of commissioning procedure

Fault finding

- Front panel LEDS
- Determining possible faults down to card replacement level
- Fuses
- BRUSH support contacts
- Spares

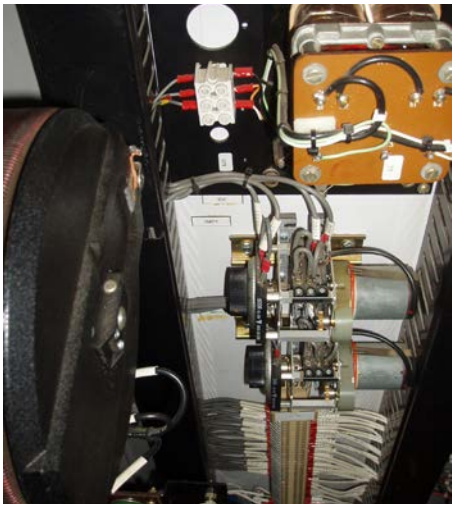
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- Certificate presentation
- Course appraisal
- Question/answer session

We are flexible with course content and times to suit customer requirements.

Training courses – Excitation Controllers:

PRISMIC® TDAVR Excitation Controller



Course covers the following:

Principles

Introduction

Applications

Hardware:

- Description
- Power transformer
- Compounding CT's
- Choke
- Controls

Features:

- Hand control
- Transfer
- Frequency drop-off
- Stability
- Droop
- Phasing
- External control
- Astatic loop control
- External bias input
- A complete guide through the customer's handbook including schemes

Operation

- 'Hands on' operation controlling a generator
- Overview of
- commissioning procedure

Fault finding

- Safety
- Common faults
- BRUSH support contacts
- Spares

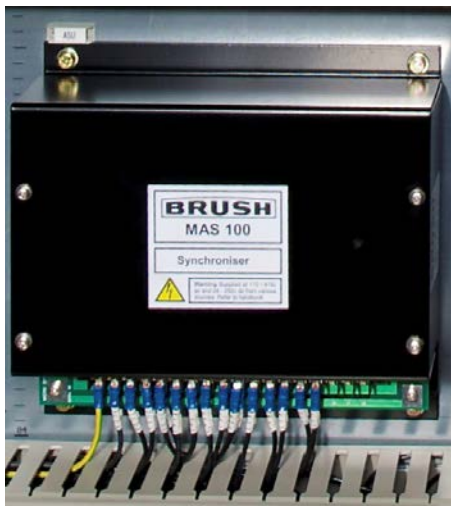
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- Certificate presentation
- Course appraisal
- Question/answer session

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Training courses – General:

Synchronising



Course covers the following:

Synchronising

Introduction

Applications

Hardware:

- Safety Precautions
- Voltage transformer
- Voltage Controls
- Frequency Controls

Setting up:

- Control Pulses
- CB Closing Time
- Dead Bus Closing
- Slip
- Phasing
- Synch window
- Dummy Synch
- Actual Synch
- Variable Closing Times
- Offsetting Voltage

- Matching for voltage drop
- Offsetting Voltage Matching to pick up MVAR
- Testing

Manual Synchronising

- Operation of Synchroscope
- Hands on Synchronising
- Commissioning procedure

Fault finding

- Safety
- Common faults
- BRUSH support contacts
- Spares

Close

- Certificate presentation
- Course appraisal
- Question/answer session

This course can be delivered as required for any BRUSH Synchroniser.

We are flexible with course content and times to suit customer requirements.

Training courses – General:

Rotor Ground Fault Monitoring and Detection (RF/R20)



Course covers the following:

Rotor Ground Fault

Introduction

Applications

Hardware:

- Signal Generation
- Transmitter
- Aerial
- REFM Rotor Earth Fault Monitor

Setting up:

- View Pulses
- Frequency Tuning
- Excitation Field Voltage Inhibit
- PMG Power Supply
- Aerial Operation
- Tuning REFM
- Tuning AVR Version
- Duplex operation
- Testing Guide
- Get hands on with REFM test rig
- Review the commissioning procedure

Fault finding

- Safety
- Common faults
- BRUSH support contacts
- Spares

Close

- Certificate presentation
- Course appraisal
- Question/answer session

We are flexible with course content and times to suit customer requirements.

For more information contact service24@brush.eu or training@brush.eu

Training courses – Generators: **Dax 2 Pole**



Course covers the following:

Overview

- Introduction
- Stator
- Rotor
- Ventilation system
- Bearings
- Slip-rings

Heat exchanger

- Internal air circuit
- External air circuit
- Cooling water supply

Bearings

- Fixed profile
- Fixed profile with thrust pad
- Tilting pad
- Insulation
- Overview of bearing operation and maintenance

Jacking oil systems

- Requirement for radial jacking oil
- Jacking oil panel
- Pipework systems

Generator enclosure/ canopy

- Enclosures
- Canopy

Maintenance philosophies

- Maintenance
- Machine deterioration
- Maintenance philosophies
- Sensory perception

Line and neutral cubicles

- Line side cubicles
- Neutral side cubicles
- Combined line and neutral cubicles

Generator cleaning

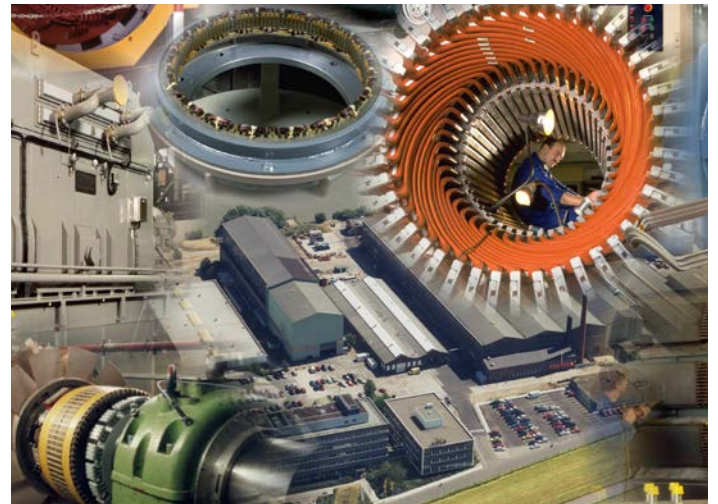
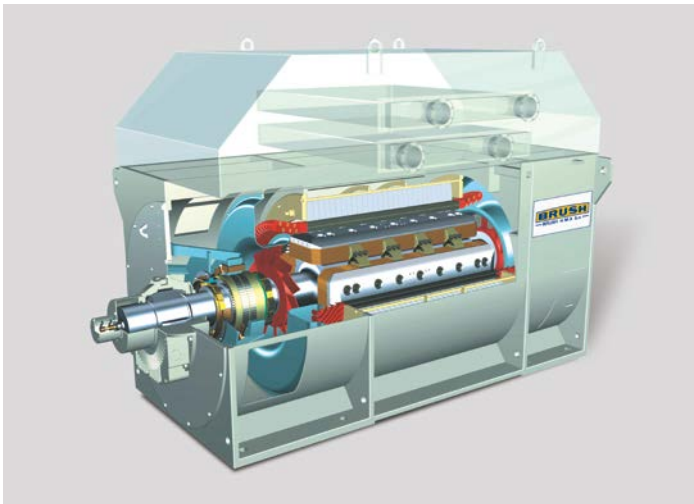
- Cleaning a seriously contaminated machine
- Cleaning by hand

Close

- Certificate presentation
- Course appraisal
- Question/answer session

We are flexible with course content and times to suit customer requirements.

Training courses – Generators: DG 4 Pole



Course covers the following:

Overview

- Introduction
- Stator
- Rotor
- Ventilation system
- Bearings
- Slip-rings

Heat exchanger

- Internal air circuit
- External air circuit
- Cooling water supply

Bearings

- Fixed profile
- Fixed profile with thrust pad
- Insulation
- Overview of bearing operation and maintenance

Jacking oil systems

- Requirement for radial jacking oil
- Jacking oil panel
- Pipework systems

Generator enclosure/ canopy

- Enclosures
- Canopy

Maintenance philosophies

- Maintenance
- Machine deterioration
- Maintenance philosophies
- Sensory perception

Line and neutral cubicles

- Line side cubicles
- Neutral side cubicles
- Combined line and neutral cubicles

Generator cleaning

- Cleaning a seriously contaminated machine
- Cleaning by hand

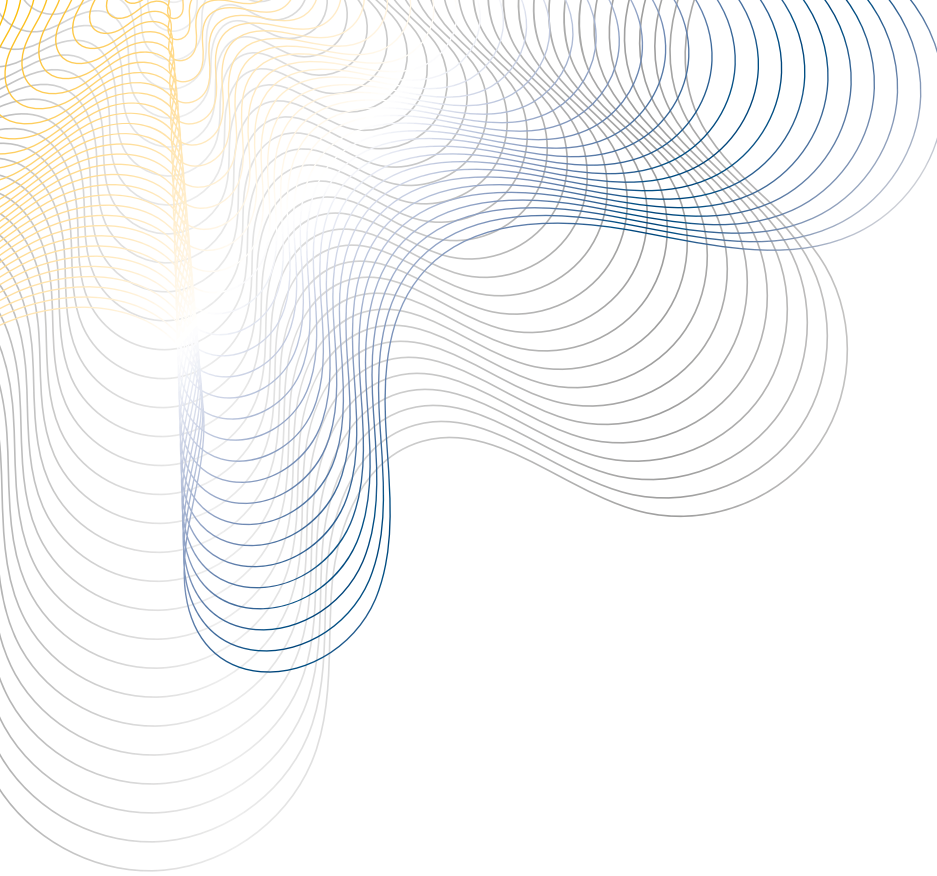
Close

- Certificate presentation
- Course appraisal
- Question/answer session

We are flexible with course content and times to suit customer requirements



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