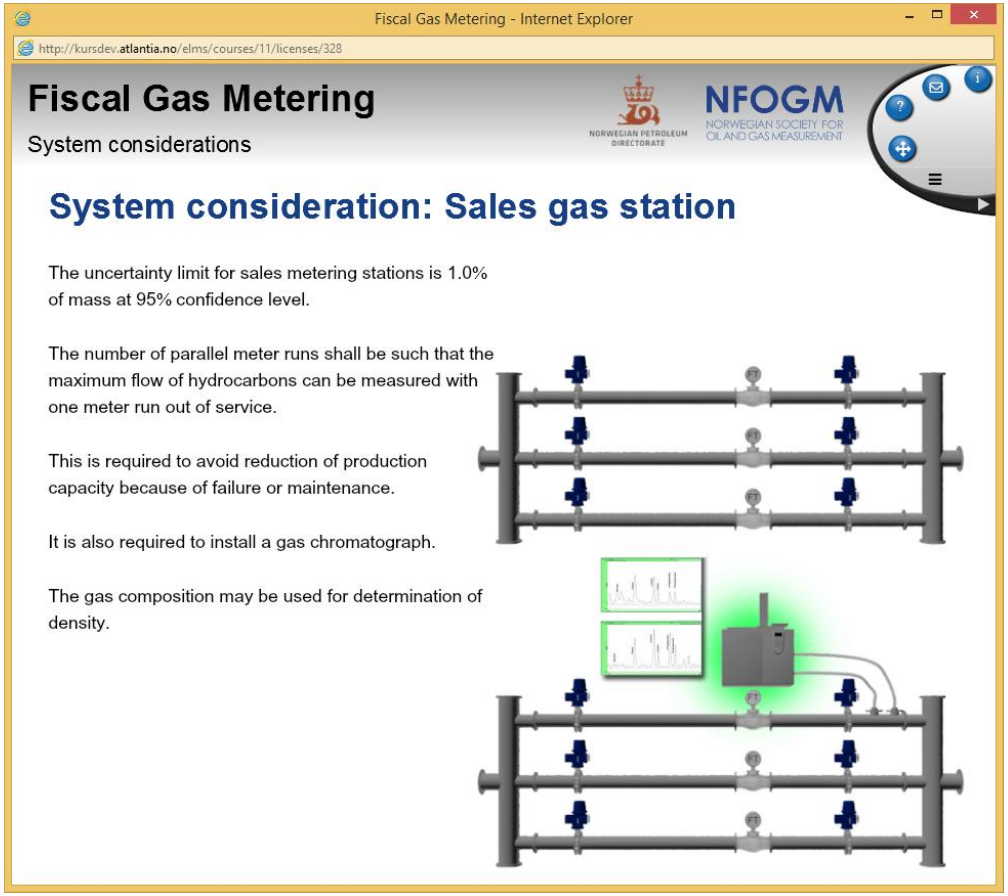
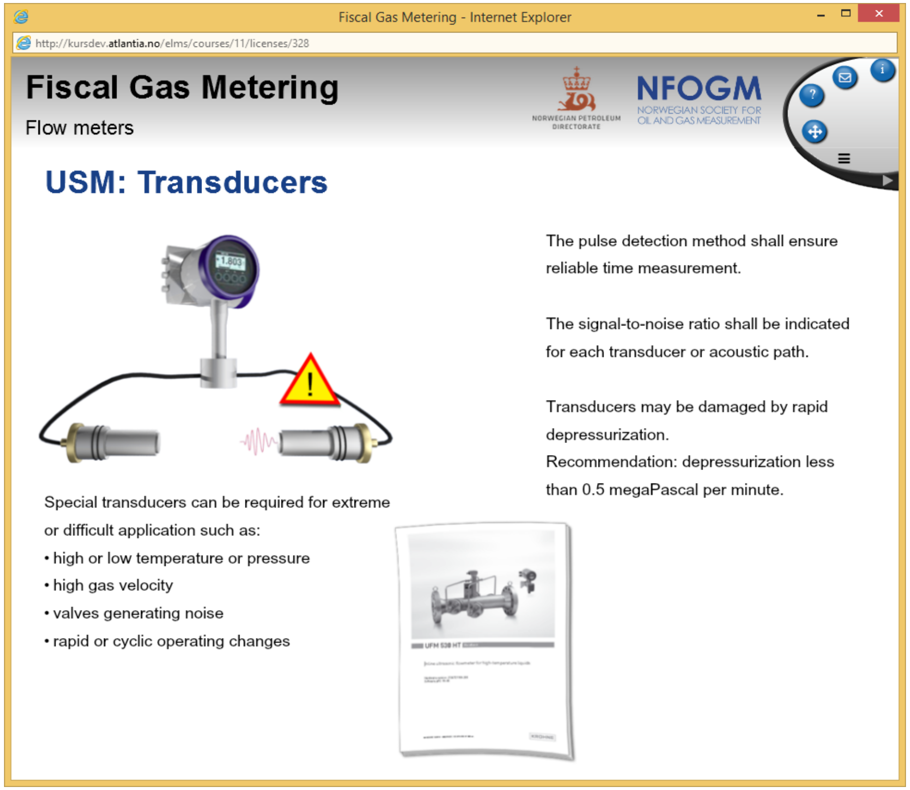
Fiscal Gas Metering

presented by Mr. Rune Øverland, Trainor Elsikkerhet AS



What is it?

- It's a computer based training course
- Accessible from www.nfogm.no
- Free of charge
- Offered for two knowledge levels



Who were involved in the development of the course?

Client: NFOGM NORSK FORENING FOR OLJE OG GASSMÅLING

Supported by: OLJEDIREKTORATET Tekna

Contractor: TRAINOR
Einar Thorén/Rune Øverland

Sub Contractors: ATLANTIA Competence gives excellence — Pål Verner Viken; cmr — Kjell-Eivind Frøysa; nitro — Simon Fellows

Reference Group: Dag Hendrik Flølo, Per Lunde and Steinar Vervik

Who are target personnel?

Level 1

- Personnel operating the measurement stations
- Administrative personnel

Level 2

- Engineers (design, verification, validating)
- Maintenance personnel (calibration, maintenance, quality checks)

What are the course objectives?

Level 1 (2 hours)

- Introduction to influencing parameters
- Measurement regulation
- Main components of measurement stations

Level 2 (4 hours)

- In addition to level 1:
- Influencing parameters
- Design of measurement stations
- NORSOK I-106, ISO standards, AGA reports

Course content

M0: Course introduction
M1: Definitions
M2: Regulation and standards
M3: Gas dynamics, flow profiles
M4: System considerations
M5: Flow meters
M6: Calibration of flow meters
M7: Secondary measurements
M8: Sampling systems
M9: Gas chromatographs
M10: Fiscal gas calculations
M11: Gas computer systems
M12: NFOGM Uncertainty tool
M13: Final assessment

How to take the course.

You are free to select either

Free navigation:

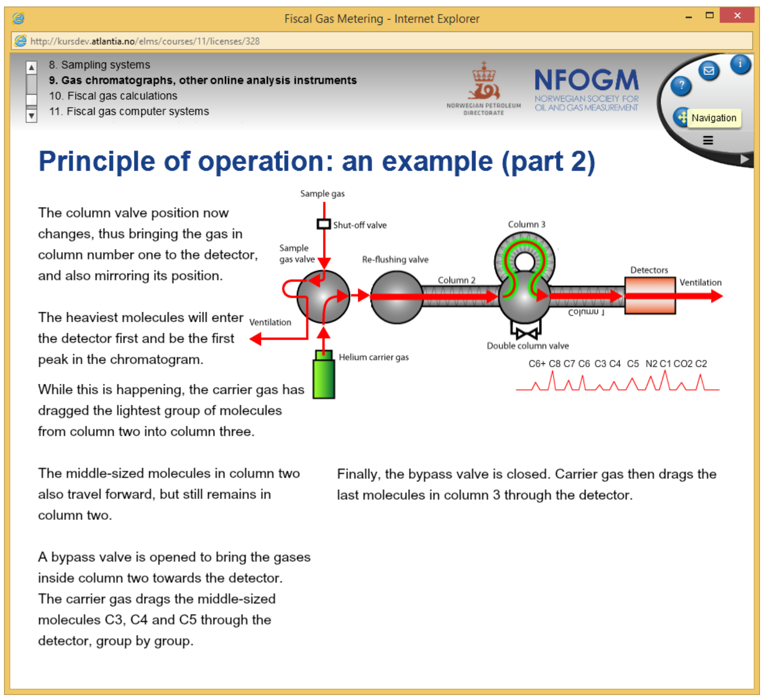
- No log on necessary
- You can navigate freely in the course.
- No final assessment

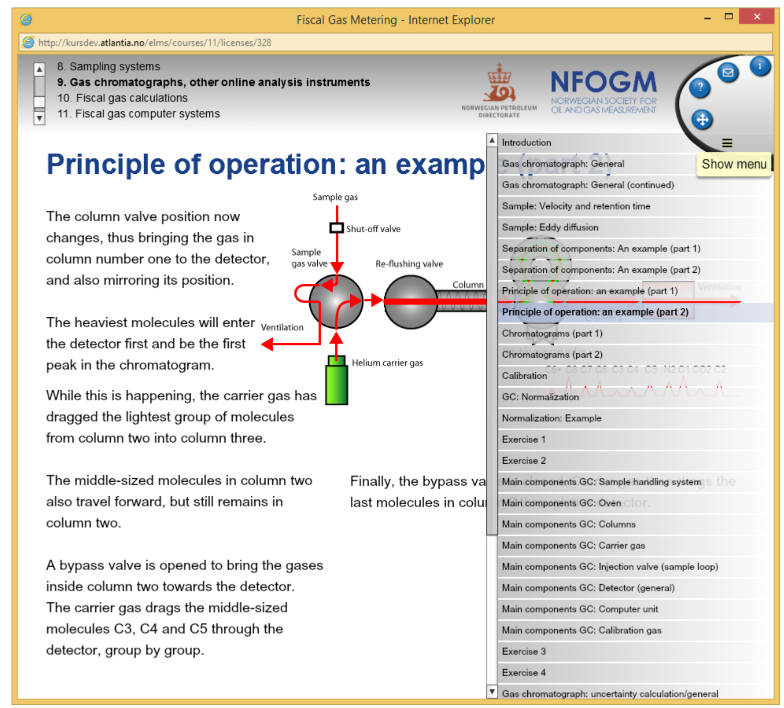
Structured training course:

- Log on necessary
- You follow a structured path of learning and exercise steps
- You can exit at any time to continue later on
- Final assessment and course certificate

Helpful navigation tools.

- Navigation Button: selects a **Module**
- Menu Button: selects a **Step** within a module



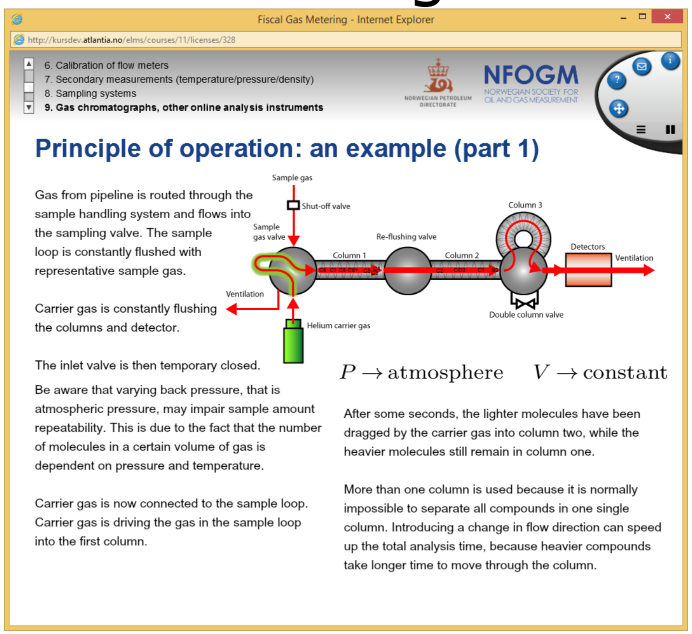


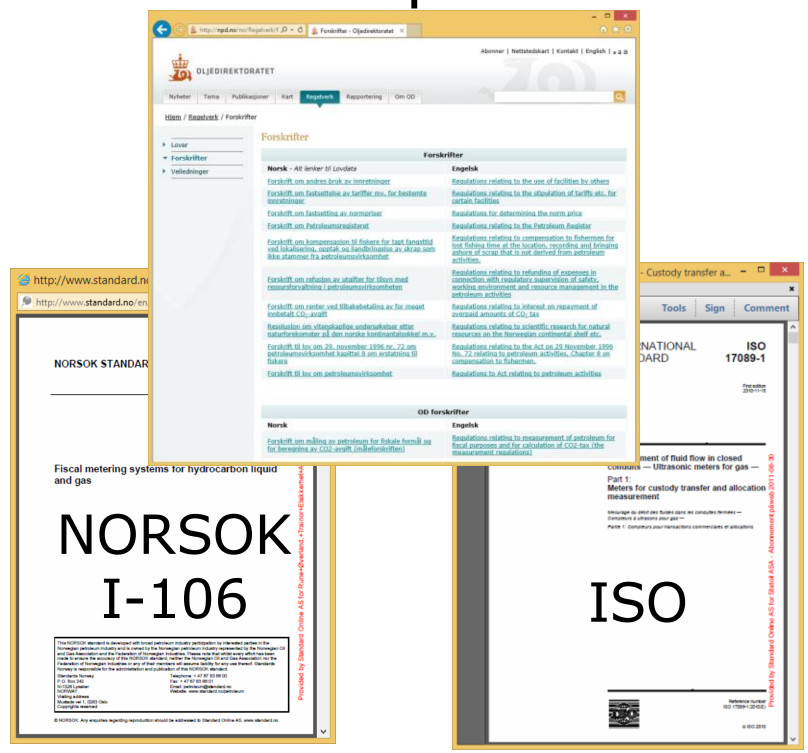
How to make the most of it.

- Combine the training course with documentation

www.npd.no

www.nfogm.no





www.standard.no

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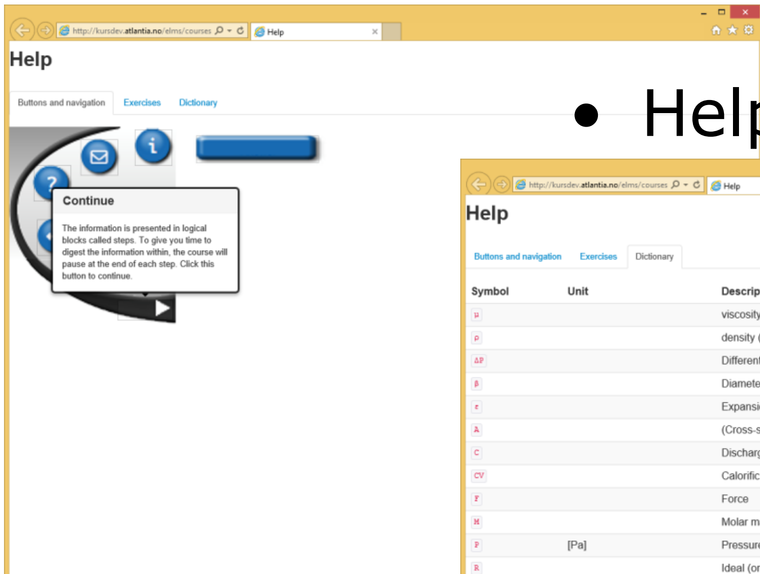
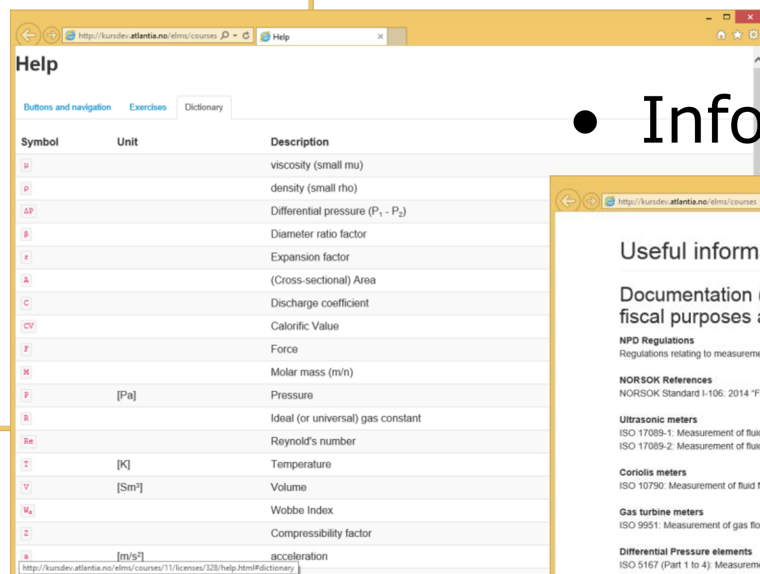
Still need help?

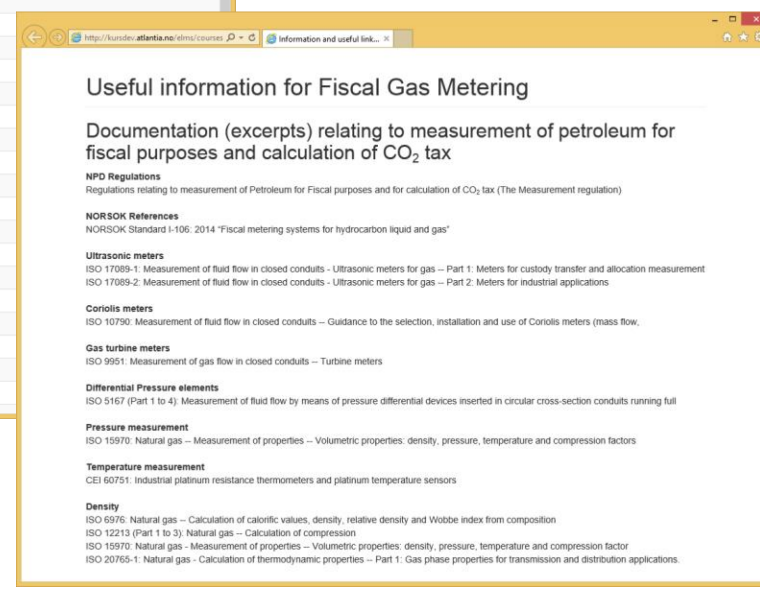
- Help: Buttons and navigation



- Help: Exercize



- Info: Documentation



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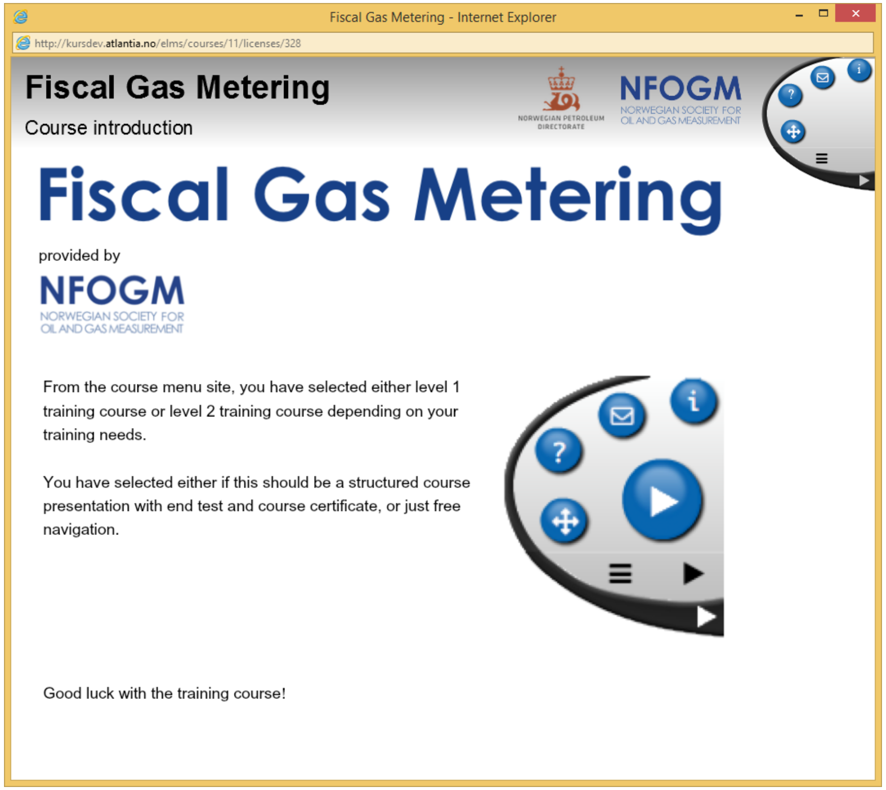
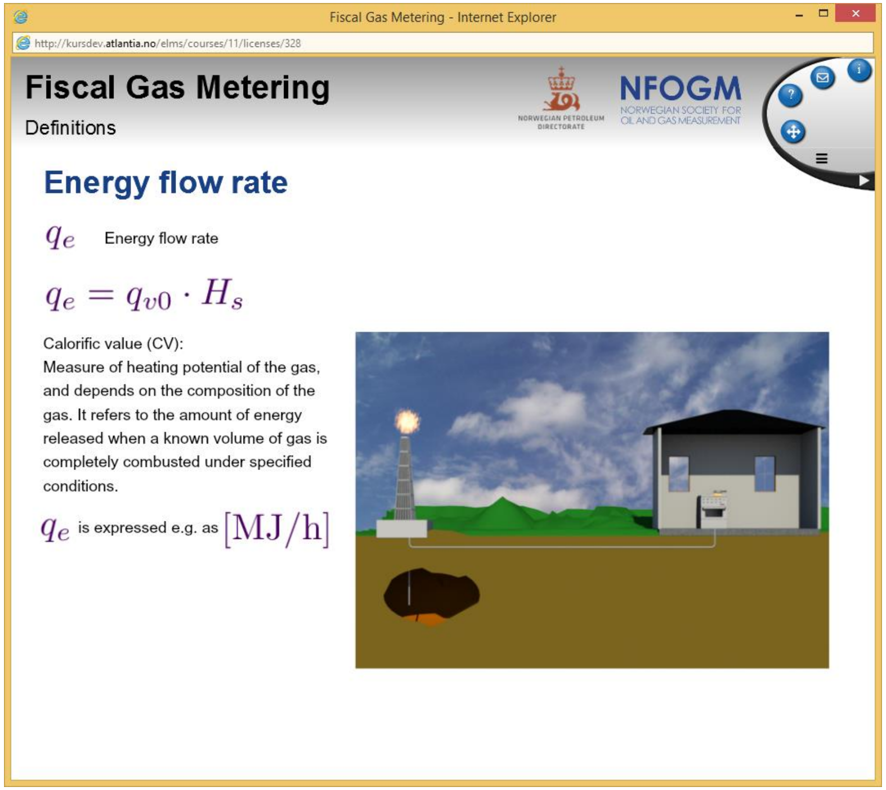
Module 0: Course introduction

- Navigation technics
- Course objectives
- Working practice
- Documentation
- Terminology



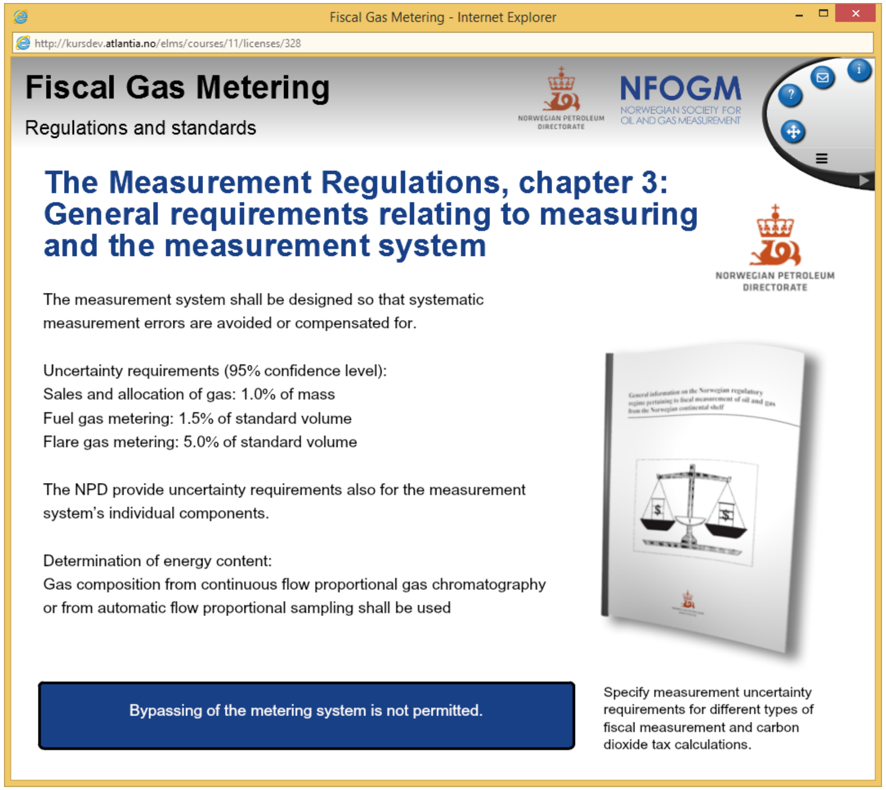
Module 1: Definitions

- Definition of terminologies
- Examples:
  - Temperature, pressure, density
  - Ideal and real gases
  - Energy flow rates
  - CO_2 emission factor
  - Repeatability, reproducibility, random error, uncertainty



Module 2: Regulations and Standards

- Norwegian Petroleum Directorate:
  The Measurement regulations
  - Chapter 1 to 8
  - Remarks to Chapter 1 to 8
- CO_2-tax act
- NORSOK I-106 (Nov 2014)



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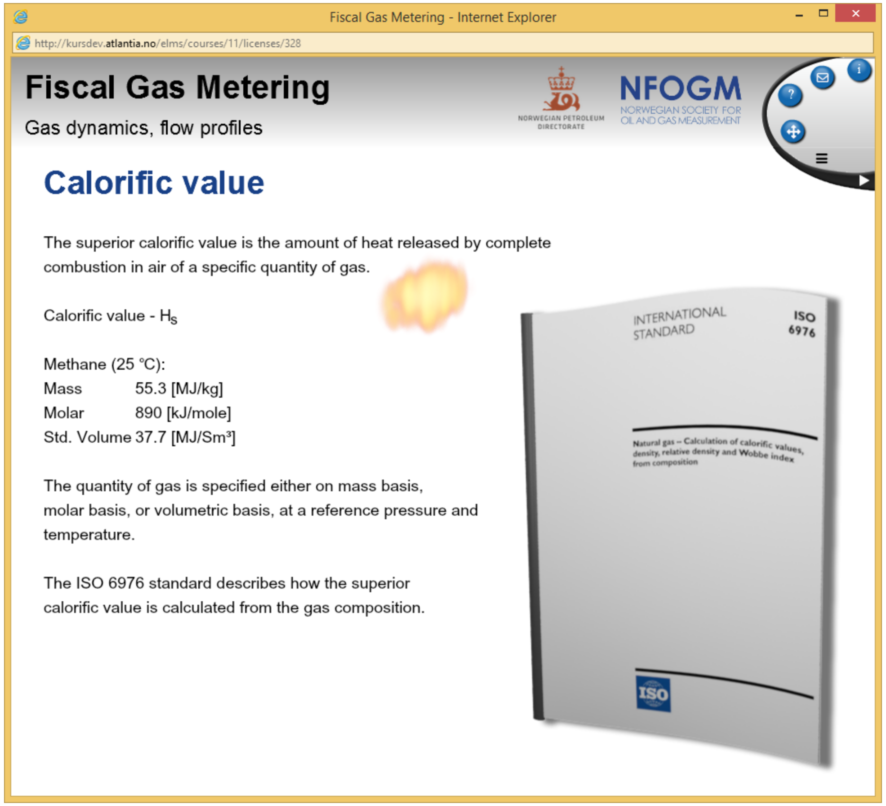
Module 3: Gas dynamics, Flow profiles

- Compressible flows
- Flow velocity profiles
- Gas laws
- Standard volume flow rate
- Mass flow rate
- Calorific value
- Energy flow rate



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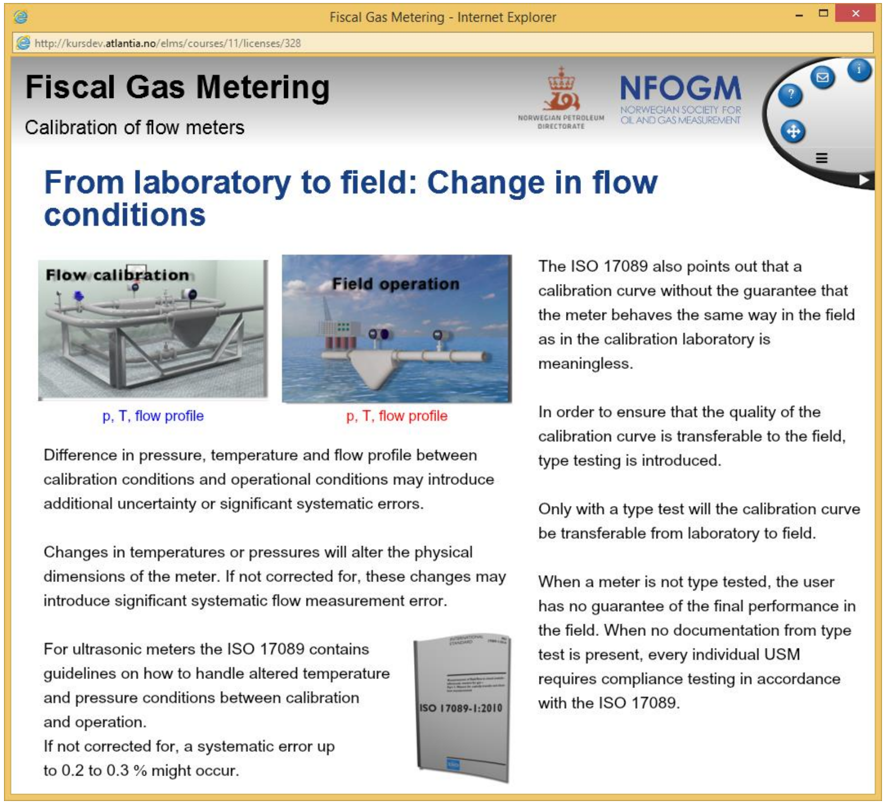
Module 5: Flow meters

- Ultrasonic Flow meter, turbine flow meter, Coriolis mass meter, Differential pressure elements (Orifice, Venturi and Cone)
- Installation, Principle of measurement, influencing parameters, NPD requirements, standards and guidelines

Module 6: Calibration of flow meters

- Ultrasonic Flow meter (ISO 17089)
- Coriolis mass meter (ISO 10790)
- Differential pressure elements (ISO 5167)
- Laboratory flow calibration, calibration certificate, from Lab to Field, recalibration, type testing



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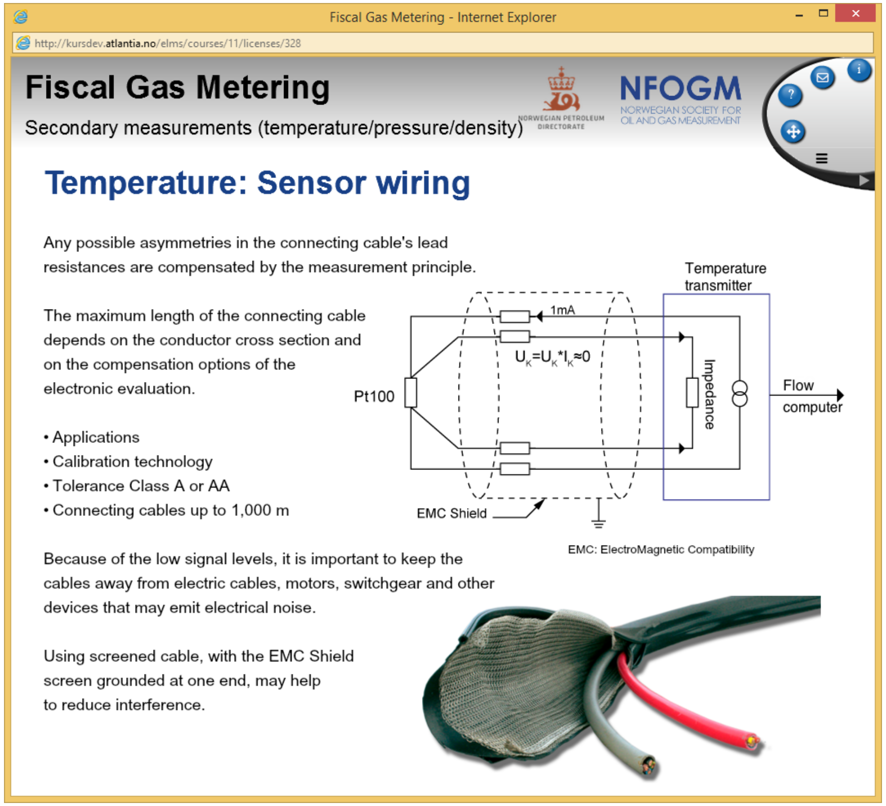
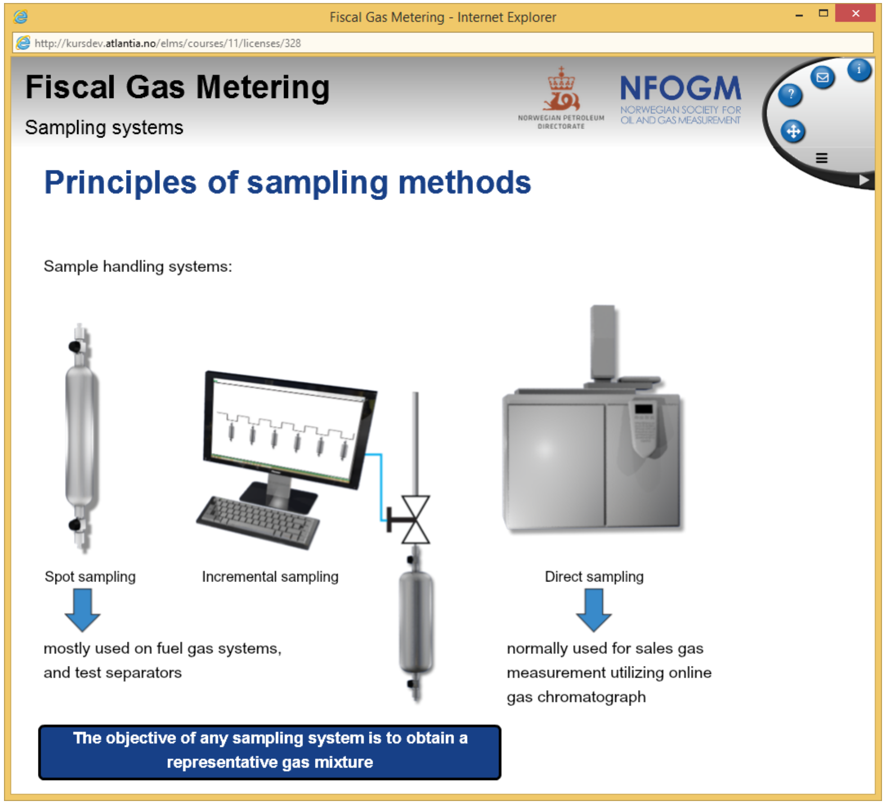
Module 7: Secondary measurements (temperature, pressure, density)

- Temperature: Pt100 element
- Static and differential pressure: Capacitive sensor element
- Densitometer: vibrating element
- Principle of measurement, requirements, installation, calibration



Module 8: Sampling systems

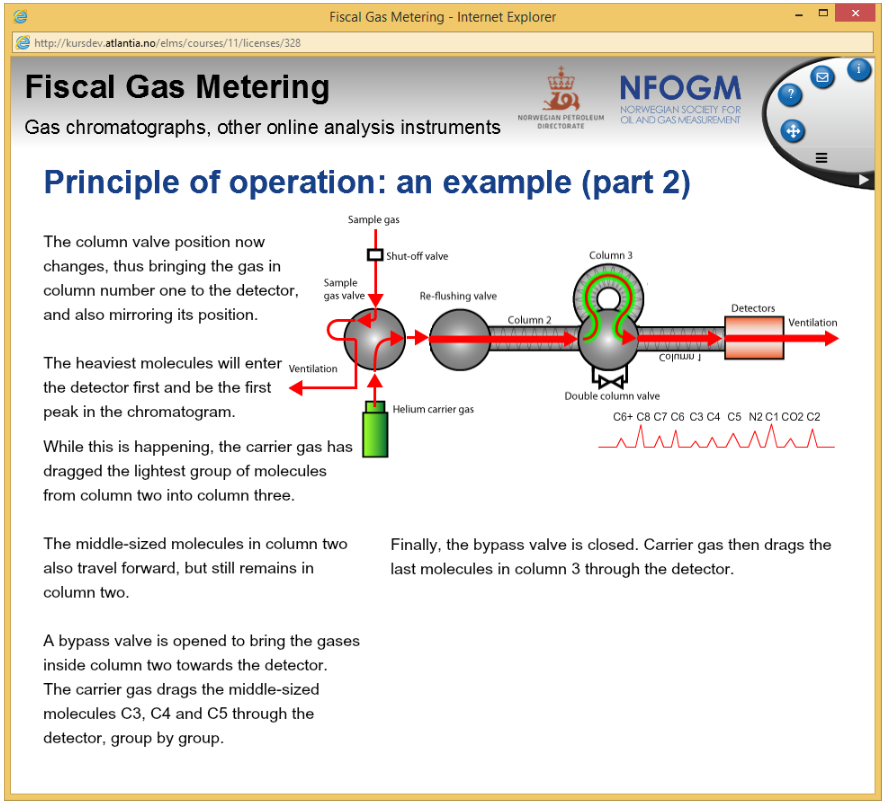
- Requirements
- Principles of sampling methods
  - Spot sampling
  - Incremental sampling
  - Direct sampling
- Sample frequency
- Isothermal expansion



Module 9: Gas chromatograph

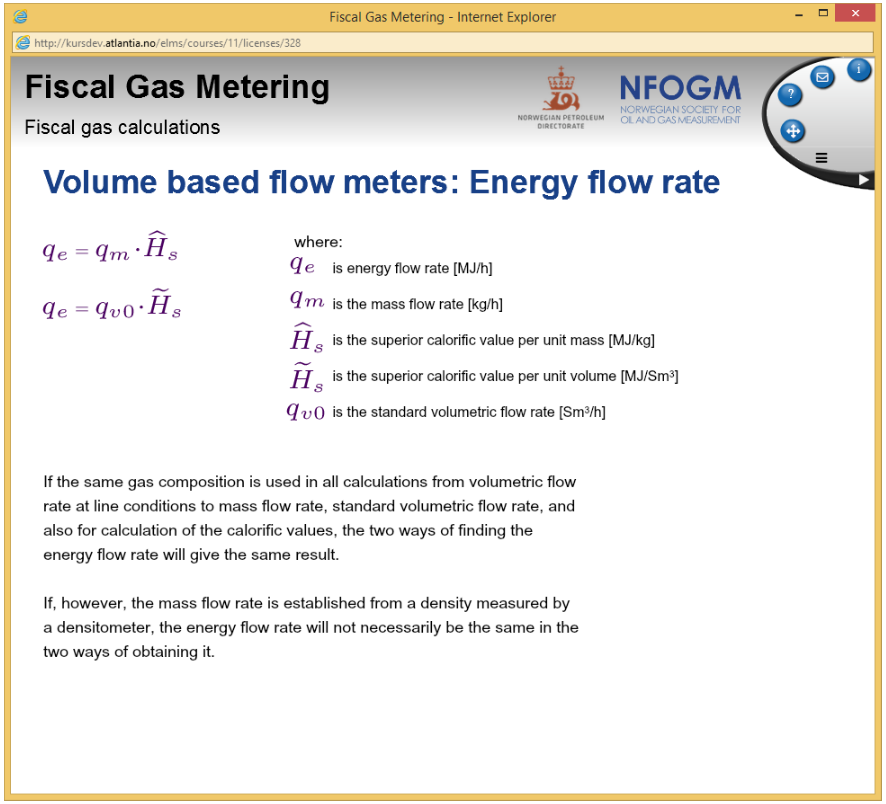
- Requirements
- Principles of separation

  Retention time, eddy diffusion
- Main components
  - Carrier gas, Injection valve, Columns, detectors,
- Chromatogram
- Calibration
- Combines uncertainty
  - Repeatability, linearity, uncertainty calibration gas



Module 10: Fiscal gas calculations

- Gas parameters
  - Relevant standards, compressibility factor, density, calorific value, CO_2 emission factor
- Volume based flow meters
- Mass based flow meters
- Differential pressure based flow meters
- Accumulated values
- CO_2 reports



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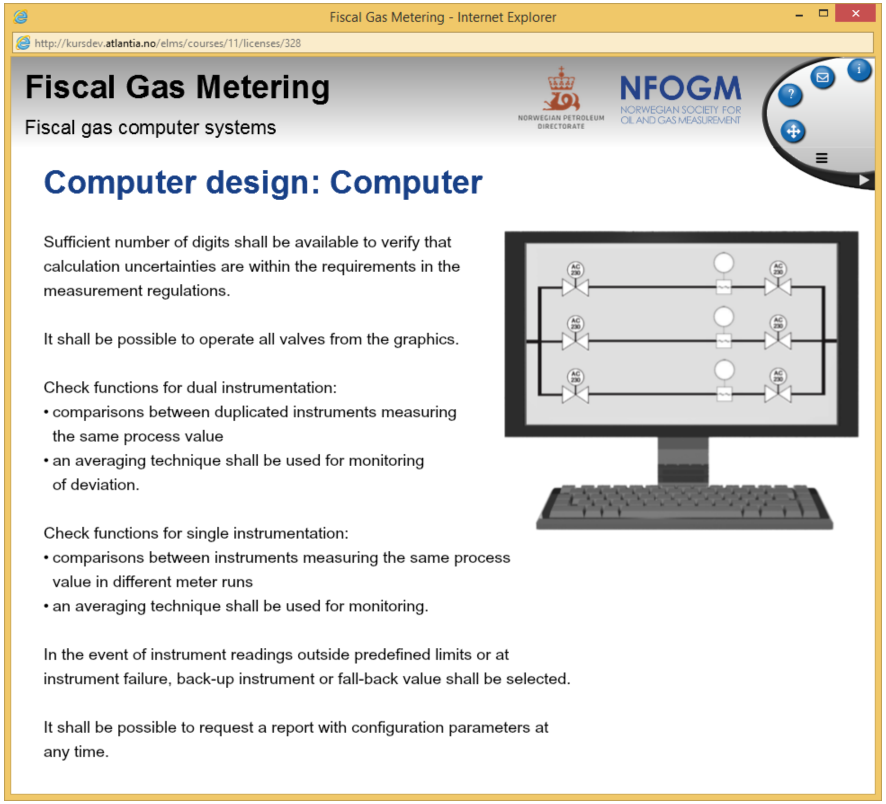
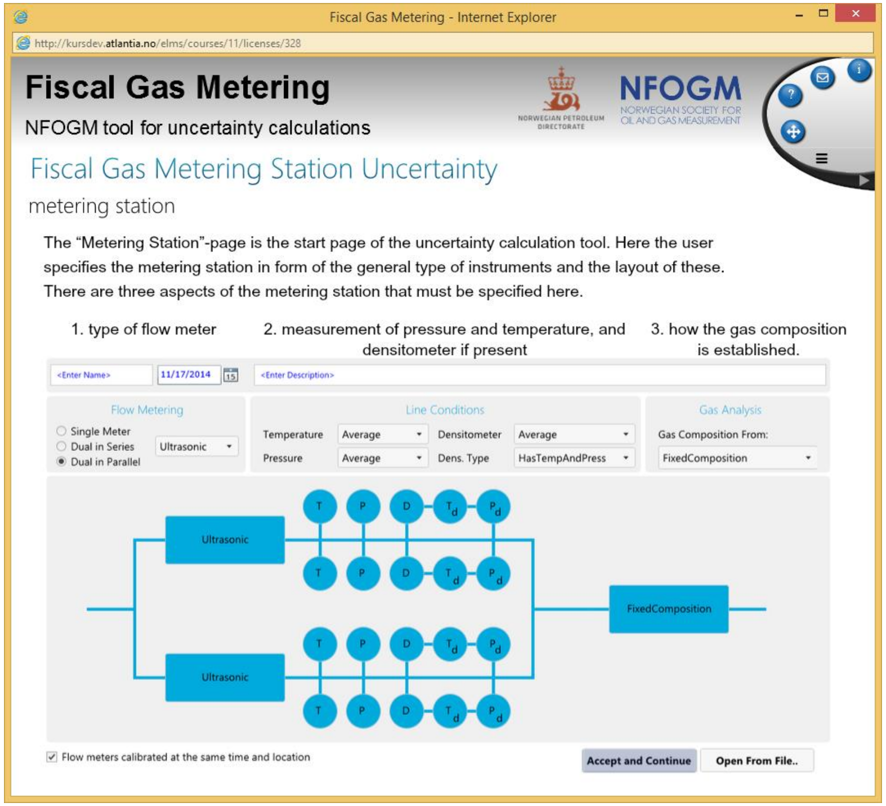
Module 11: Fiscal gas computer systems

- The Measurements regulation
- Flow Computer design
- Supervisory system
- Alarms and events
- Provisions for gas metering stations



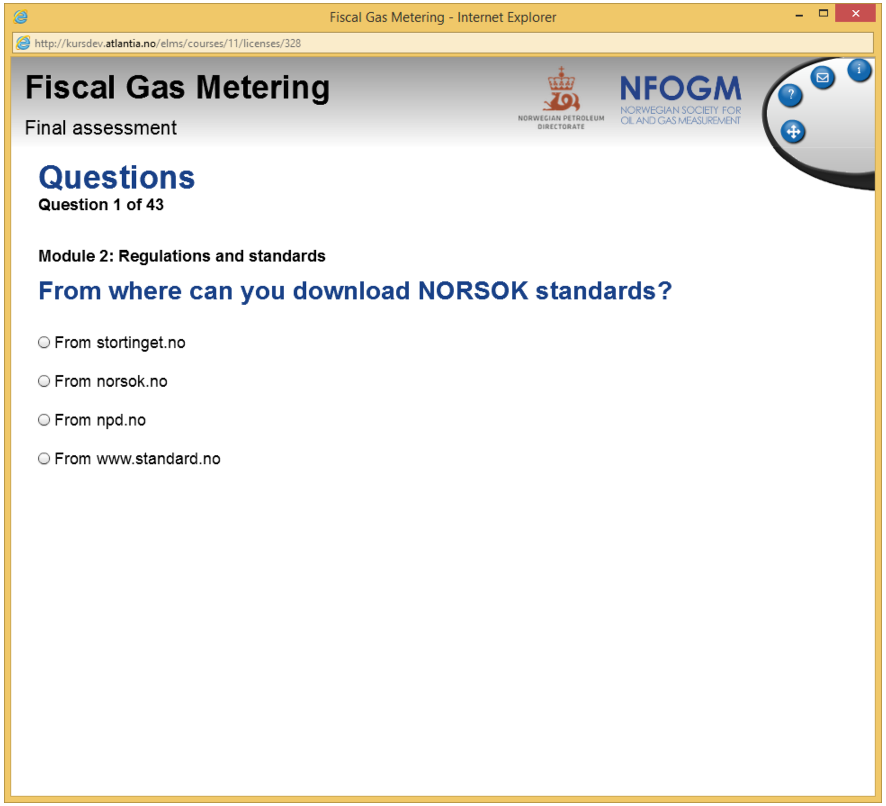
Module 12: NFOGM tool for uncertainty calculations

- NFOGM tool web based
- Configuration of tool parameters
  - Series or parallel design
  - Flow meter: USM, Coriolis, Orifice
  - Single or dual temperature/pressure etc
- Generating of results
- Charts, plots
- Reports



Module 13: Final assessment

- Level 1 and Level 2 has their own Final test
- To pass, more than 70 % correct answers
- A course certificate is stored at My page, and can be printed.



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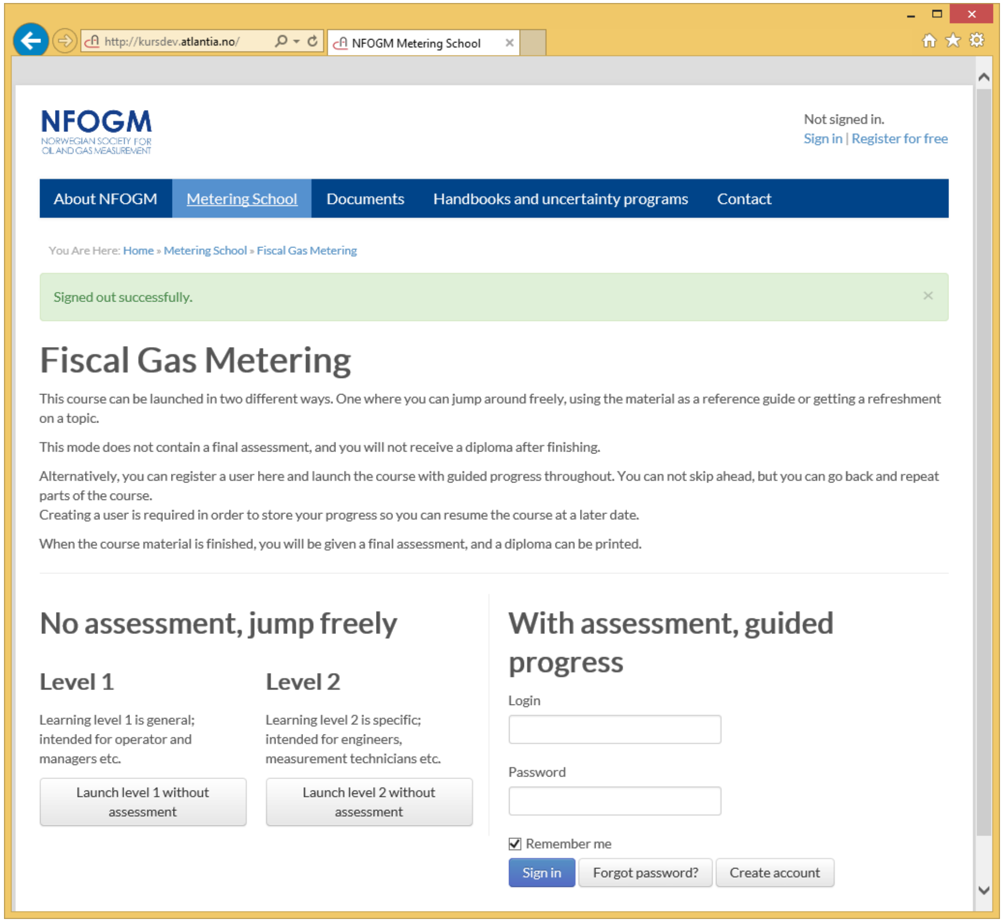
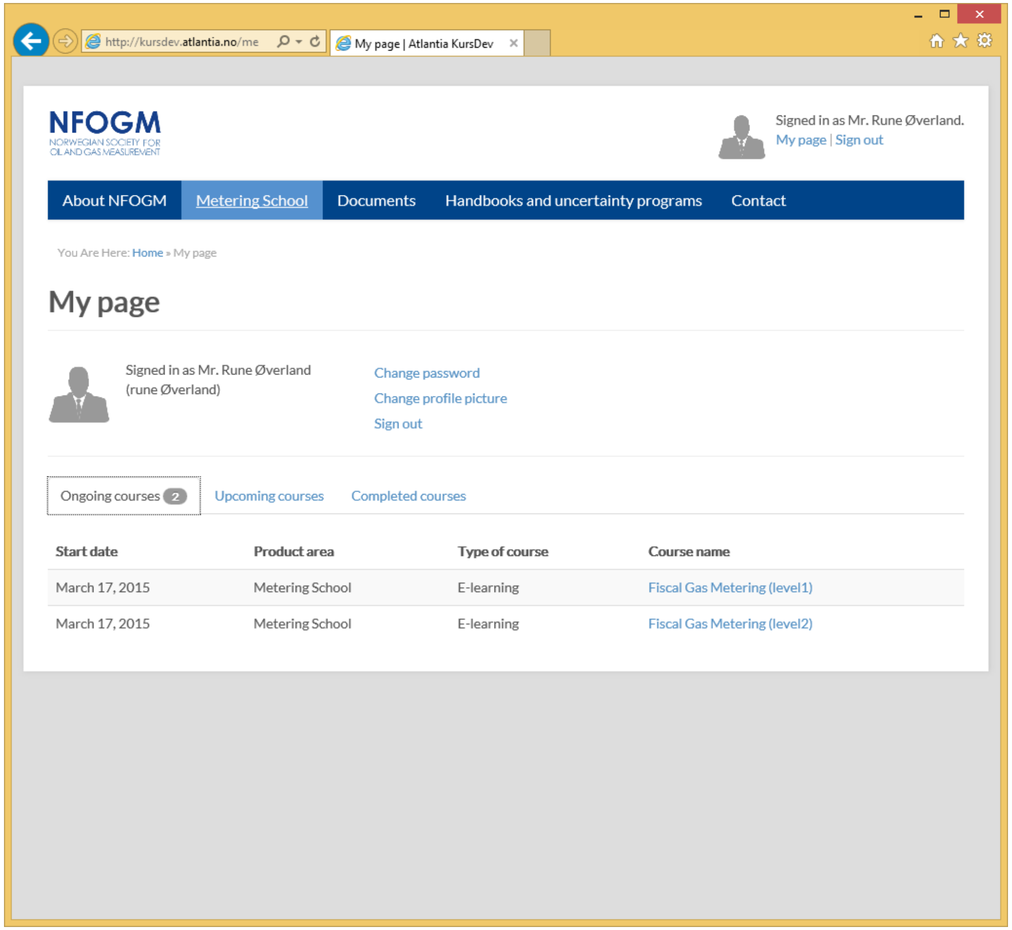
NFOGM Gas metering course

- www.nfogm.no
  - Metering school
  - Start the application
  - Select Free navigation (select Level 1 or Level 2)
  - or select Course (create account)/ (select Level 1 or Level 2)



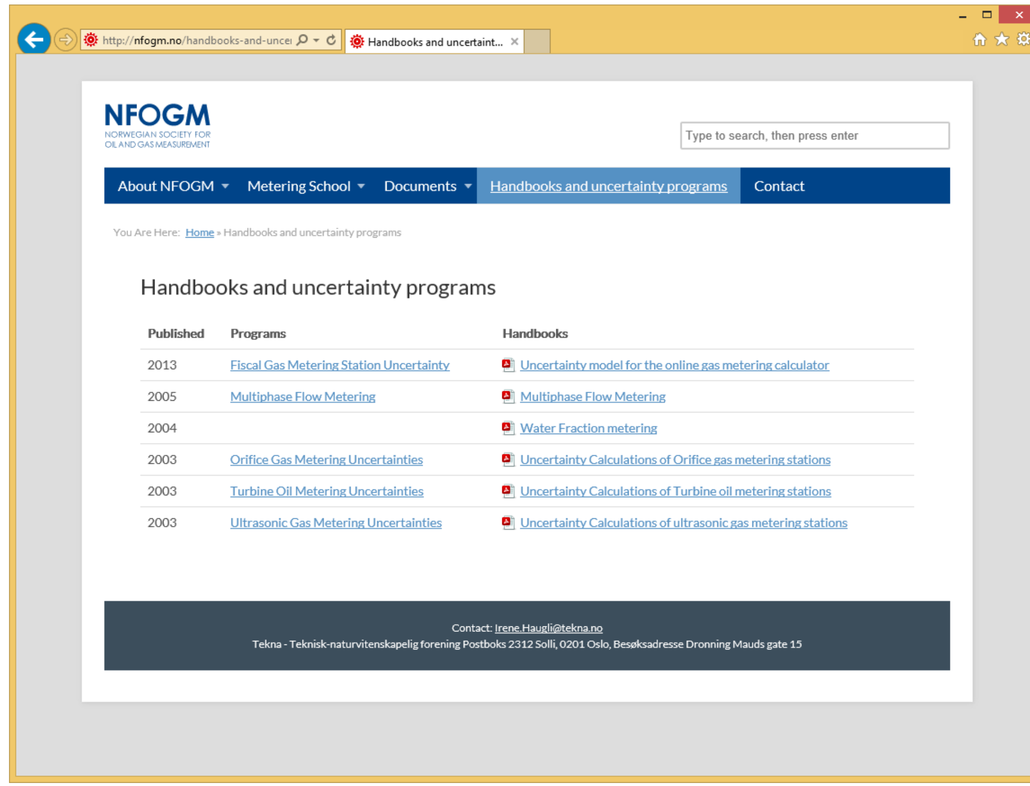
NFOGM Gas metering course

- My page
  - Ongoing courses
  - Completed courses (print out of Diplomas)



NFOGM uncertainty tool, and handbooks

- www.nfogm.no
  - Handbooks and uncertainty programs



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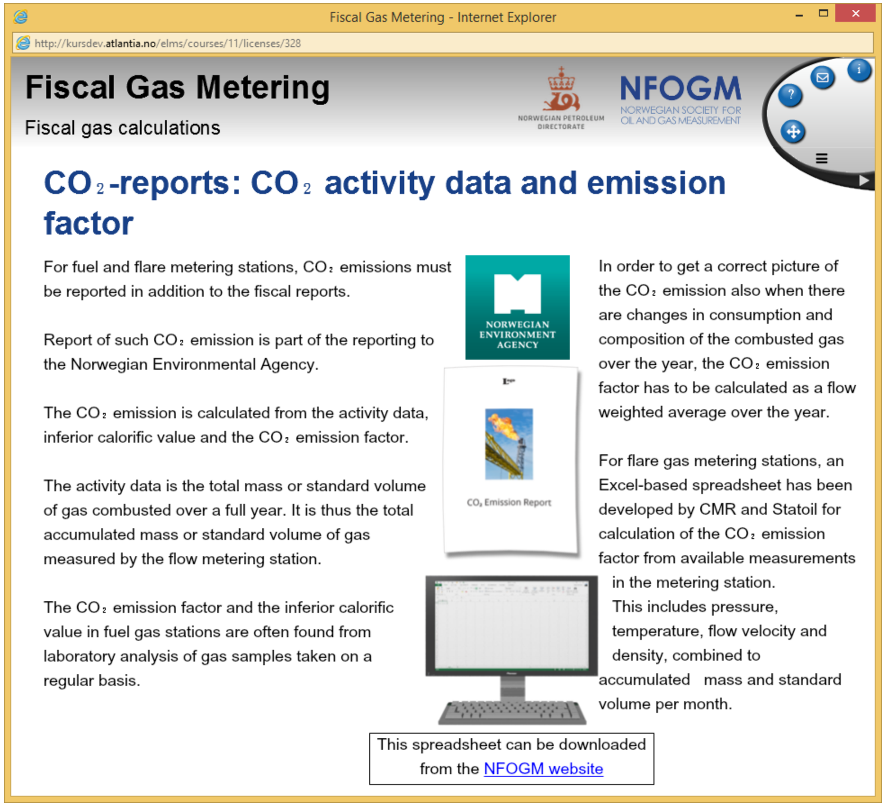
Flare gas metering station: Calculation of the CO2 emission factor

- www.nfogm.no
  - Excel spreadsheet can be downloaded free of charge



Summary: Fiscal Gas Metering

- Two computer based training courses (Level 1 and Level 2)
- Free of charge
- Available from www.nfogm.no
- Choose either free navigation or structured course progress