TETRA TECH RPS ENERGY | TRAINING

CAPABILITY DEVELOPMENT
FOR THE ENERGY SECTOR

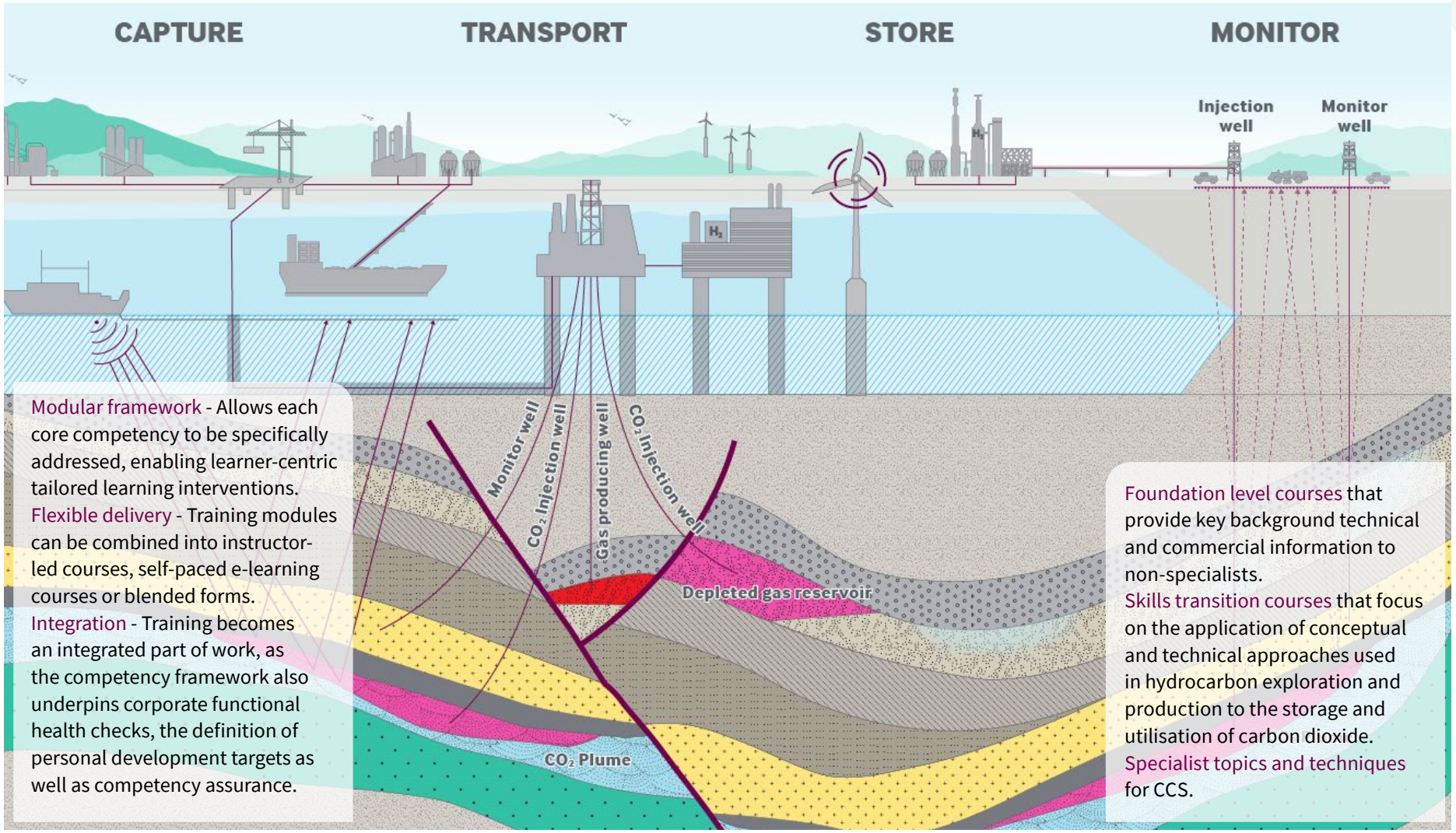
CARBON CAPTURE AND STORAGE

MEETING THE DEMAND FOR THE DEVELOPMENT OF SKILLS AND KNOWLEDGE RELEVANT TO CCS

Version 1.0 - 08 Nov 2024

Leading with Science®

SKILLS DEVELOPMENT FOR CARBON CAPTURE AND STORAGE

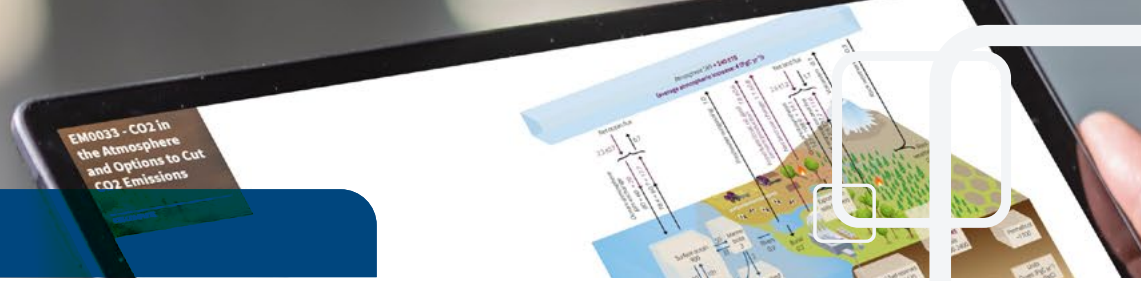


Modular framework - Allows each core competency to be specifically addressed, enabling learner-centric tailored learning interventions.
Flexible delivery - Training modules can be combined into instructor-led courses, self-paced e-learning courses or blended forms.
Integration - Training becomes an integrated part of work, as the competency framework also underpins corporate functional health checks, the definition of personal development targets as well as competency assurance.

Foundation level courses that provide key background technical and commercial information to non-specialists.
Skills transition courses that focus on the application of conceptual and technical approaches used in hydrocarbon exploration and production to the storage and utilisation of carbon dioxide.
Specialist topics and techniques for CCS.

CCS CURRICULUM

GENERAL COURSES - INSTRUCTOR LED



Foundational Understanding for CCS and Hyrogen Underground Storage

The course provides a practical introduction to CCS as a potentially effective technology for the reduction of CO_2 emissions from power generation units or chemical processing plants. The course includes an understanding of how to evaluate the economics of CCS projects and the future outlook of CCS worldwide.

Instructors: Srikanta Mishra | **Code:** N535 | **Duration:** 4 sessions or 2 days | **Skill level:** Foundation | MORE INFO

Repurposing Subsurface Petroleum Skills for CCUS

This course empowers attendees to develop and apply their skills to Carbon Capture Utilization and Storage (CCUS). Attendees will be guided through the lifecycle of a CCUS project with an emphasis on key concepts, processes, and workflows with a focus will be on developing the geoscience and engineering skills needed.

Instructors: Alex Bump, Seyyed Hosseini, Katherine Romanak | **Code:** N538 | **Duration:** 5 sessions or 3 days | **Skill level:** Skilled | MORE INFO

Subsurface Characterization, Screening and Site Selection for Geologic CO_2 Storage Sites

This course empowers attendees to develop and apply their skills to the growing industry of Carbon Capture Utilization and Storage. Attendees will be guided through the subsurface characterization and risk assessment of a storage site. Focus will be on the geologic needs for site definition, screening and development.

Instructors: Susan Hovorka | **Code:** N549 | **Duration:** 3 sessions or 2 days | **Skill level:** Skilled | MORE INFO

Carbon Capture and Storage for Geoscientists and Engineers

This course will provide participants with awareness and understanding of the subsurface needs of CCS projects including subsurface CO2 storage volumetrics, CO2 flow away from injector wells, the objective of permanent and safe storage of CO2, and the key issues of well design and reservoir depth, lithology, quality, and architecture.

Instructors: Richard Worden | **Code:** N565 | **Duration:** 5 sessions or 3 days | **Skill level:** Foundation | MORE INFO

Outcrop Analogues for CO_2 Storage (Devon and Dorset, UK)

The course provides a practical introduction to CCS as a potentially effective technology for the reduction of CO_2 emissions from power generation units or chemical processing plants. The course includes an understanding of how to evaluate the economics of CCS projects and the future outlook of CCS worldwide.

Instructors: Srikanta Mishra | **Code:** N535 | **Duration:** 4 sessions or 2 days | **Skill level:** Skilled | MORE INFO

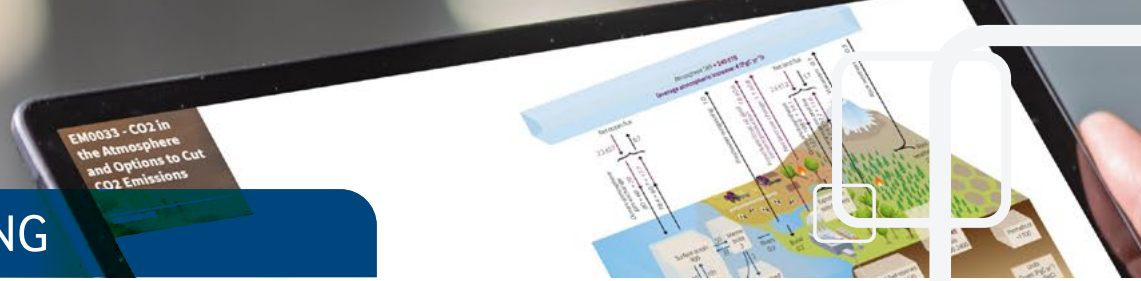
The Economics of CCS Projects

This course looks at the factors likely to affect the emergence of a global “market or commodity price” for the transport and storage of CO_2. At its simplest, the fully built-up cost structure for capturing and delivering molecules of CO_2 to a T&S company and paying their fees needs to be more attractive to an emitter than the cost of emitting the CO_2.

Instructors: Andy Kirchin | **Code:** N668 | **Duration:** 2 sessions or 1 days | **Skill level:** Foundation | MORE INFO

CCS CURRICULUM

GENERAL COURSES - SELF-PACED E-LEARNING



Fundamentals of CCS

This course provides participants with awareness and understanding of the subsurface needs of CCS projects. It will establish basics such as how much CCS is needed to make a difference to global warming and explore what types of CO_2 injection have already happened including dedicated long-term CCS projects, pilot projects and CO2-enhanced oil recovery projects.

Code: EC003 | **Duration:** 5 hours | **Skill level:** Foundation | MORE INFO

Geological Storage of CO_2

This course provides participants with understanding of geological subsurface CO_2 storage volumetrics, CO_2 flow in the subsurface away from injector wells, the objective of permanent and safe storage of CO_2. It also covers the key issues of reservoir depth, well design, reservoir lithology, reservoir quality, and reservoir architecture.

Code: EC004 | **Duration:** 5 hours | **Skill level:** Foundation | MORE INFO

Behaviours of CO_2 in Reservoirs

The course addresses CO_2 as a fluid phase and the key question of CO2 storage efficiency. The course will address the rate of CO_2 injection and the role reservoir permeability. The all-important issue of the geomechanical effects of CO_2 injection and feedbacks between induced mineral dissolution and rock strength and other rock properties will be addressed.

Code: EC005 | **Duration:** 6 hours | **Skill level:** Foundation | MORE INFO

Monitoring CO_2 Storage

This course considers the range of potential leakage mechanisms that need to be assessed. It will include a detailed consideration of the monitoring strategies available to assure the safety and integrity of the CO_2 storage site.

Code: EC006 | **Duration:** 4 hours | **Skill level:** Foundation | MORE INFO

The Geoscience of CO_2 Storage - Package

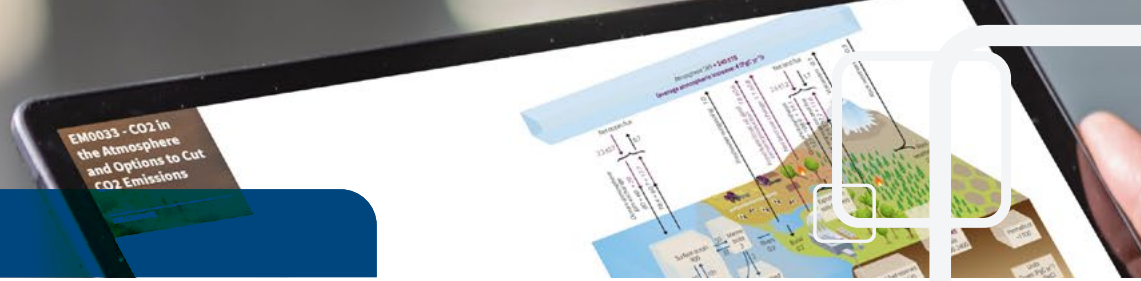
This package of Carbon Capture and Storage (CCS) self-paced e-learning courses will provide geoscientists and engineers with an awareness and understanding of subsurface CO_2 storage, CO_2 flow in the subsurface, and monitoring of the CO_2 storage site. It addresses the key issues of reservoir depth, well design, reservoir lithology, and quality.

- Fundamentals of CCS (EC003)
- Geological Storage of CO_2 (EC004)
- Behaviours of CO_2 in Reservoirs (EC005)
- Monitoring CO_2 Storage (EC006)

Code: EP001 | **Duration:** 20 hours | **Skill level:** Foundation | MORE INFO

CCS CURRICULUM

SPECIALIST COURSES - INSTRUCTOR LED



Reservoir Modelling for Storage

This course will summarise the unique issues when modelling for storage. Participants will learn to consider fluid properties, heterogeneity, geomechanics, seismic monitoring, and scale. Modelling the 'storage complex' requires models that encompass not just the target reservoir, but also the surrounding rock volumes where the injected fluid plume is expected to migrate to.

Instructors: Tim Wyn | **Code:** N535 | **Duration:** 5 sessions or 3 days | **Skill level:** Foundation | MORE INFO

Monitoring Geologic CO_2 Storage Sites

Monitoring geological CO_2 storage sites is a critical element of a CCS project and is generally required over all phases of a project and throughout the entire stratigraphy from reservoir to surface. The choice of tools and approach is highly specific to site conditions, project goals and regulatory requirements.

Instructors: Susan Hovorka, Katherine Romanak | **Code:** N553 | **Duration:** 5 sessions or 3 days | **Skill level:** Foundation | MORE INFO

Transforming 60-years of CO_2-EOR Experience into Shale Oil Recovery and CO_2 Sequestration

This course provides clear, concise and practical information for understanding and implementing the CO_2 enhanced oil recovery into unconventional reservoirs. The recovery discussions will be complemented with technical discussions on the depleted wells for CO_2 sequestration and carbon credit.

Instructors: Yucel Akkutlu | **Code:** N555 | **Duration:** 6 sessions or 3 days | **Skill level:** Skilled | MORE INFO

Storage Exploration – Screening and Selection of CO_2 Sites

This course considers the systematic evaluation of regional structure and stratigraphy to identify potential sites for geological storage of CO2, beginning with a wide range CCS development concepts, potentially encompassing onshore or offshore, new or adaptation of existing infrastructure and open aquifers as well as closed structures.

Instructors: Jim Lorsong, Pete Smith| **Code:** N584 | **Duration:** 3 sessions or 2 days | **Skill level:** Skilled | MORE INFO

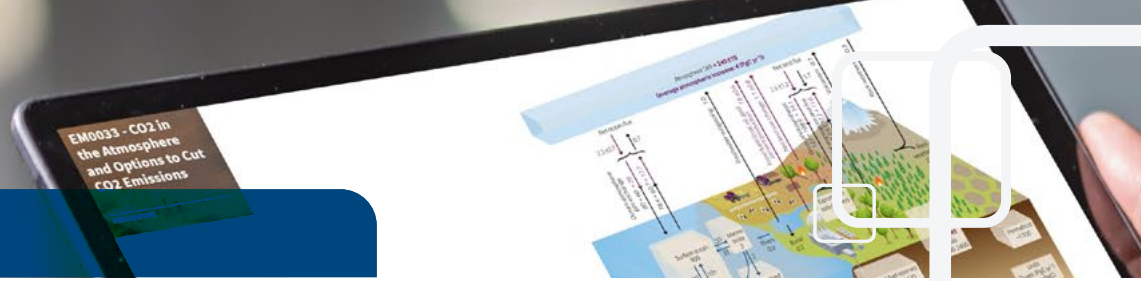
CO_2 Containment and Storage Monitoring

The course considers physical mechanisms of stabilisation of injected CO2, as well as potential geological migration pathways. It considers design of an integrated, cost-effective monitoring programme to address site-specific subsurface and well CO2 containment risks.

Instructors: Jim Lorsong | **Code:** N585 | **Duration:** 3 sessions or 2 days | **Skill level:** Skilled | MORE INFO

CCS CURRICULUM

SPECIALIST COURSES - INSTRUCTOR LED



Geomechanics for CCS Projects

Starting with some basics of geomechanics and working towards description and examples of sophisticated geomechanical modelling in the context of CCS, this course outlines the importance of geomechanics in CCS projects: caprock integrity, fault reactivation, induced seismicity, fracture influence on reservoir flow, reservoir management, drilling and completion parameters.

Instructors: Kes Heffer, Nick Koutsabeloulis | **Code:** N590 | **Duration:** 4 sessions or 2 days | **Skill level:** Skilled | MORE INFO

Geochemistry of CCS: Reservoirs, Seals and the Engineered Environment

The geochemistry of saline aquifers, depleted oil/gas fields and CO2 are considered alongside the reactions of CO2 with different reservoir rock minerals and cements. The course includes geochemical modelling, reactions within well bores and the monitoring of CCS sites.

Instructors: Richard Worden | **Code:** N591 | **Duration:** 4 sessions or 3 days | **Skill level:** Skilled | MORE INFO

Well Engineering for CO_2 Storage Applications

This course covers the design specifics of CO2 injection wells. Such wells may be existing or new wells which need to be designed with the challenges of CO2 injection in mind. The design includes the casing, cement, completion and all associated equipment. The challenges covered included potentially highly corrosive (to metals and cements) fluids, large temperature changes associated with potential phase changes.

Instructors: Jonathan Bellarby | **Code:** N592 | **Duration:** 5 sessions or 3 days | **Skill level:** Skilled | MORE INFO

Reservoir Characterisation and Simulation for CCS

A course that considers the geological features of storage sites, focussing on the heterogeneity and presence of faults which can lead to complex flow patterns. Flow simulation model objectives cover storage capacity, integrity assessment, development planning and operational monitoring.

Instructors: Andy Woods, Pete Smith | **Code:** N593 | **Duration:** 3 sessions or 2 days | **Skill level:** Skilled | MORE INFO

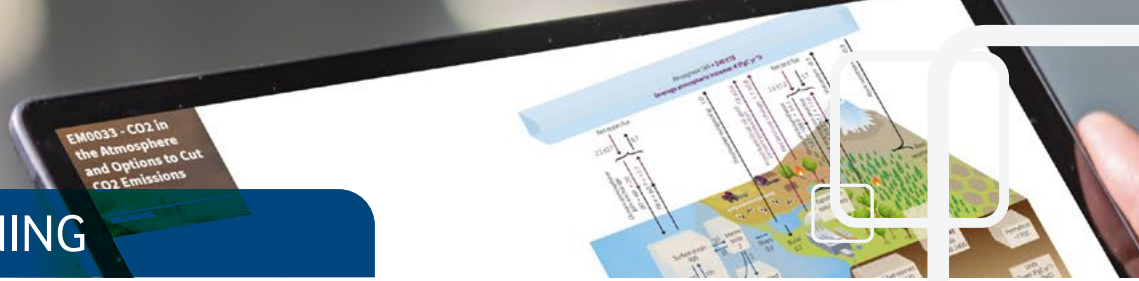
CO_2 Plume Behaviour in a Reservoir

This course explores the controls on the flow of a CO2 plume in a saline aquifer, the fraction of pore space occupied and the rate of dissolution in brine. It covers the controls on the migration of CO2 in the post-injection phase and modelling of how far the CO2 will spread.

Instructors: Andy Woods| **Code:** N594 | **Duration:** 2 sessions or 1 day | **Skill level:** Skilled | MORE INFO

CCS CURRICULUM

SPECIALIST COURSES - SELF-PACED E-LEARNING



Petrophysics for CCS

This course considers the properties of carbon dioxide, contrasts its behaviour with that of methane and the interactions between CO2 and water in an aquifer. There is a review of some of the properties of CO2 that affect how different wireline logs respond to it, in particular the significant effects that the gas has on sonic and neutron log responses.

Code: EC007 | **Duration:** 7 hours | **Skill level:** Foundation | MORE INFO

Storage Exploration – Screening and Selection of CO_2 Sites

This course considers the systematic evaluation of regional structure and stratigraphy to identify potential sites for geological storage of CO2, beginning with a wide range CCS development concepts, potentially encompassing onshore or offshore, new or adaptation of existing infrastructure and open aquifers as well as closed structures.

Code: EC029 | **Skill level:** Foundation | IN DEVELOPMENT

CO_2 Containment and Storage Monitoring

The course considers physical mechanisms of stabilisation of injected CO2, as well as potential geological migration pathways. It considers design of an integrated, cost-effective monitoring programme to address site-specific subsurface and well CO2 containment risks.

Code: EC030 | **Skill level:** Foundation | IN DEVELOPMENT

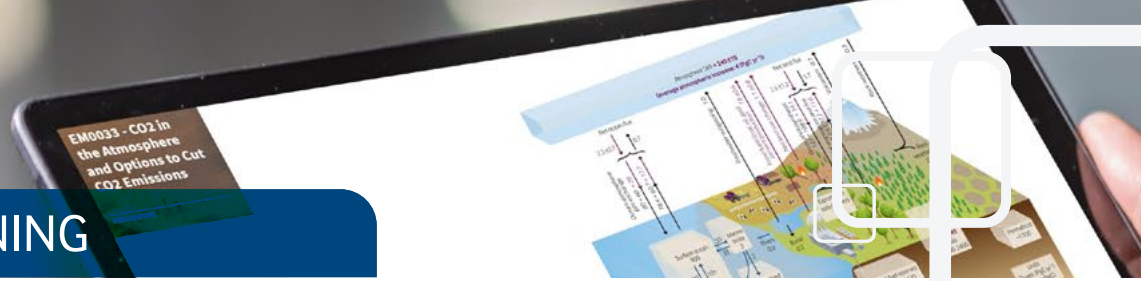
Geomechanics for CCS Projects

Starting with some basics of geomechanics and working towards description and examples of sophisticated geomechanical modelling in the context of CCS, this course outlines the importance of geomechanics in CCS projects: caprock integrity, fault reactivation, induced seismicity, fracture influence on reservoir flow, reservoir management, drilling and completion parameters.

Code: EC031 | **Skill level:** Foundation | IN DEVELOPMENT

CCS CURRICULUM

SPECIALIST COURSES - SELF-PACED E-LEARNING



Geochemistry of CCS Projects

The chemistry of saline aquifers, depleted oil/gas fields and CO2 are considered alongside the reactions of CO2 with different reservoir rock minerals and cements. The course includes geochemical modelling, reactions within well bores and the monitoring of CCS sites.

Code: EC032 | **Skill level:** Foundation | IN DEVELOPMENT

Well Engineering for CO_2 Storage Applications

This course covers the design specifics of CO2 injection wells. Such wells may be existing or new wells which need to be designed with the challenges of CO2 injection in mind. The design includes the casing, cement, completion and all associated equipment.

Code: EC033 | **Skill level:** Foundation | IN DEVELOPMENT

Reservoir Characterisation and Simulation for CCS

Course considers the geological features of storage sites, focussing on the heterogeneity and presence of faults which can lead to complex flow patterns. Flow simulation model objectives cover storage capacity, integrity assessment, development planning and operational monitoring.

Code: EC034 | **Skill level:** Foundation | IN DEVELOPMENT

CO_2 Plume Behaviour in a Reservoir

This course considers the controls on the flow of a CO2 plume in a saline aquifer, the fraction of pore space occupied and the rate of dissolution in brine. It covers the controls on the migration of CO2 in the post-injection phase and modelling of how far the CO2 will spread.

Code: EC035 | **Skill level:** Foundation | IN DEVELOPMENT

INTERACTIVE DEMOS

FUNDAMENTALS OF CCS **LAUNCH MODULE**

INTERACTIVE DEMOS

CO_2 IN THE ATMOSPHERE **LAUNCH MODULE**

CCS CURRICULUM

INTEGRATED COURSES - INSTRUCTOR LED

Core Analysis for Petroleum and CCS Applications

A course designed to help attendees design core analysis and SCAL test programmes for both oil and gas reservoirs and carbon capture storage (CCS) in aquifers and depleted gas and oil reservoirs. The participants will also learn how to quality check and use legacy core analysis and SCAL data.

Instructors: Adam Moss | **Code:** N671 | **Duration:** 5 sessions or 3 days | **Skill level:** Foundation | MORE INFO

GeoPressure Essentials: Managing Subsurface Pressures for Oil & Gas and Carbon Storage

This course offers a comprehensive overview of well planning and the strategic use of subsurface pressure data throughout the entire lifecycle of oilfields and carbon capture projects. Participants will be introduced to the fundamentals of well planning, pore pressure prediction, and the influence of geopressure on the petroleum cycle.

Instructors: Stephen O'Connor | **Code:** N679 | **Duration:** 8 sessions or 4 days | **Skill level:** Foundation | MORE INFO

Sandstone Diagenesis and Reservoir Quality for Exploration, Appraisal, Field Development, and CCS Projects

For geoscientists working in the geoenergy sectors of CCS and oil and gas, this course offers a comprehensive exploration of sandstone reservoir quality and diagenesis. It is designed to enhance understanding of how these factors impact exploration, appraisal, field development, and CCS projects.

Instructors: Richard Worden | **Code:** N675 | **Duration:** 5 sessions or 3 days | **Skill level:** Skilled | MORE INFO

Carbonate Reservoir Quality for Hydrocarbon and CCS applications

This course reviews case examples and end-member scenarios of carbonate reservoir heterogeneity, while discussing how to depict the multiscale heterogeneity patterns in cores and logs, to assess/apply process-based rules and to enable flow unit correlations. The role of multiscale heterogeneity and its relevance for injection projects and potential impact on early breakthrough (including CCS projects) is discussed.

Instructors: Arve Lonoy, Mateu Esteban and Conxita Taberner | **Code:** N676 | **Duration:** 5 sessions or 3 days | **Skill level:** Skilled | MORE INFO

Characteristics of Alluvial, Coastal, and Shallow Marine Reservoir Successions for Reservoir Management, Gas Storage, and CO_2 Sequestration (Utah, USA)

This course examines the three-dimensional stacking patterns and internal reservoir properties of paralic successions for reservoir evaluation and management, using the Cretaceous succession of the Henry Mountains and Capitol Reef National Park. Participants will learn to recognize key reservoir facies of paralic successions, their geometries and stacking patterns and reservoir properties, and applications to reservoir management.

Instructors: Chris Fielding | **Code:** N681 | **Duration:** 5 day field course | **Skill level:** Skilled | MORE INFO

Multi-Disciplinary Skills for Sustainable Field Development Planning for Hydrocarbon and CCS projects

This course considers the technical and commercial influences on Sustainable Field Development Planning within the global oil and gas industry. It considers the need for understanding field developments by, resource size, facility choice, development risk, cost and value, as well as the environmental implications of the development. It inclujdea a consideration of carbon capture and storage in the planning process.

Instructors: Peter Smith | **Code:** N680 | **Duration:** 5 sessions or 3 days | **Skill level:** Skilled | MORE INFO

CCS CURRICULUM

INTEGRATED COURSES - INSTRUCTOR LED

Understanding Faults and Fault Rupture – Applications to Fluid Trapping, Pressure Containment, and Induced Seismicity for Hydrocarbons and CCS (Utah, USA)

This course provides an analysis-level treatment of fault geometry, characterisation of trap effectiveness, and assessment of rupture hazard with application to hydrocarbon exploration, reservoir development and management, fluid pressure containment analysis for CCS, and induced seismicity hazard assessment.

Instructors: Peter Hennings, Robert Krantz | **Code:** N579 | **Duration:** 5 day field course | **Skill level:** Skilled | MORE INFO

Salt Tectonics and Halokinetic Sequences Concepts in the Onshore Lusitanian Basin (Portugal)

Attendees will gain first-hand insights into salt-related deformation and sedimentation processes, directly applicable to reservoir properties, hydrocarbon accumulations, geothermal potential, and CCUS projects. This immersive experience equips them with advanced skills, reducing operational risks and optimizing resource management.

Instructors: Pedro Barreto | **Code:** N662 | **Duration:** 5 day field course | **Skill level:** Skilled | MORE INFO

Modelling of Reservoir Structure & Fractures - Applications to CCS, Gas Storage, Geothermal, Oil & Gas (Somerset, UK)

This course provides a practical, integrated approach to characterising, classifying, analysing and modelling natural fractures. It uses lectures, modelling software and field examples to deliver an understanding of: geomechanics; the building and use of simple conceptual and more complex finite difference models; and the impact of fractures on well and reservoir productivity and recovery.

Instructors: Tim Wynn and Ed Stephens | **Code:** N923 | **Duration:** 5 day field course | **Skill level:** Skilled | MORE INFO

COURSE ACCESS

Scheduled courses

RPS delivers field, classroom and online courses focusing on core skills development and current challenges facing the E&P industry. Courses are delivered by instructors recognised as world class subject matter experts in their field, including industry leaders, professors and distinguished lecturers.

RPS' scheduled courses can be accessed through your corporate Nautilus Training Alliance (NTA) Membership or courses can be booked on-demand as required online by credit card or invoice.

Self-paced e-learning

Offered independently or as part of a blended learning program, RPS' bespoke e-learning solutions immerse learners in a rich variety of content and interactive media to provide a personalised learning experience. By providing access to the RPS e-learning catalogue or producing custom content, RPS can help organisations leverage technology to engage their learners in a dynamic and exciting digital learning environment.

With each new course, you will find an overview of what the course covers and what's associated with the specific course elements in the introductory module page. Specific competencies are addressed through videos, presentation materials, interactive quizzes, 3D models, text and voice-overs. Each module is designed for flexible learning and allows for variable periods of interaction with content to suit individual needs.

Courses can be accessed wither via a corporate license or can be booked on-demand as required online by credit card or invoice.

Inhouse courses

The same best in class virtual, field and classroom courses focusing on core skills development and current challenges but delivered inhouse for groups typically of 10 to 20 participants. Courses delivered by instructors recognised as world class subject matter experts.

Designed to meet technical requirements – Learning events are tailored to address learning outcomes most relevant to the team in the workplace. Can include variations across all subject areas and specifics to address cross-disciplinary challenges. Established courses can be delivered off-the-shelf or customised to meet specific technical focus and level.

Flexible locations – Either in your office, or virtually to provide training for participants in multiple locations.

Flexible schedules – Delivered in continuous sessions, or distributed over a longer period of time to suit operational requirements.

Efficient - Team focused training is a cost effective means of learning and development for technical staff with shared technical challenges.

Book a course or make an inhouse course enquiry:
training.rpsgroup.com/contact-us/

BLENDED LEARNING

A learning approach of building knowledge through interactive on-line modules with skills development in instructor-led virtual, classroom or field based workshops, exercises and scenario-based activities.

1 WHY

- Self-paced learning of foundation knowledge and skills followed by instructor-led sessions which focus on practical applications provides an efficient and effective blended pathway.

2 WHAT

- Based on the requirements of the organisation and the needs of the individual.
- Designed for cohorts of staff and scheduled as required.
- Self-paced learning modules are available as required.
- Instructor-led sessions may be in-person or virtual.
- Workshops concentrate on integrating knowledge and developing applications of skills through scenario-based exercises.

3 WHO

- Our approach is suitable for cohorts of staff in a wide range of roles in different sizes of organisation.
- Applicable to organisations or discipline sectors of all sizes and is particularly suitable for a distributed workforce.

4 HOW

MODULAR Allows creation of unique training pathways through on-line learning whilst retaining an integrated approach to skills development through classroom and field workshops.

FLEXIBLE Customised content is accompanied by flexibility of scheduling, fitting in with work patterns to be operationally friendly.

ADAPTABLE Methods of delivery are adaptable, with content provided as self-paced learning modules (where available) and/or instructor-led sessions in person or virtually.

COST EFFECTIVE More cost efficient than conventional classroom courses and more effective than on-line training in isolation.

5 SUBJECT AREAS

Oil and Gas

Carbon Management and Gas Transition

Sustainable Heat - Geothermal

Environmental, Social and Governance (ESG)

Certificates for Professional Development

Certificates for Professional Development Hours (PDH) and/or Continuing Education Units (CEU) are issued for application toward your professional development.

We are accredited by the International Association for Continuing Education and Training (IACET) and is authorized to issue the IACET CEU. We comply with the ANSI/IACET Standard, which is recognised internationally as a standard of excellence in instructional practices.

Visit the IACET website

All Geoscience and Professional Skills Development courses on the Nautilus Training Alliance have been accredited by the Geological Society, London and approved for Continuing Professional Development for geoscientists who are working towards or have received Chartered Geologist status.

Visit the Geological Society of London's website

TETRA TECH RPS ENERGY | TRAINING

Our goal is to collaborate with our customers to develop the competencies and capability of their workforce through integrated learning that supports their roles and promotes individual development driving organisational excellence. Our expertise brings flexible and scalable solutions from a diverse energy portfolio in the design, development of technical content and knowledge-based programmes delivered by expert instructors. Our technical and learning expertise help organisations develop the competencies, skills and knowledge they need to fulfil their collective potential.

CONTACT

W: training.rpsgroup.com

E: rps.energytraininginfo@tetratech.com