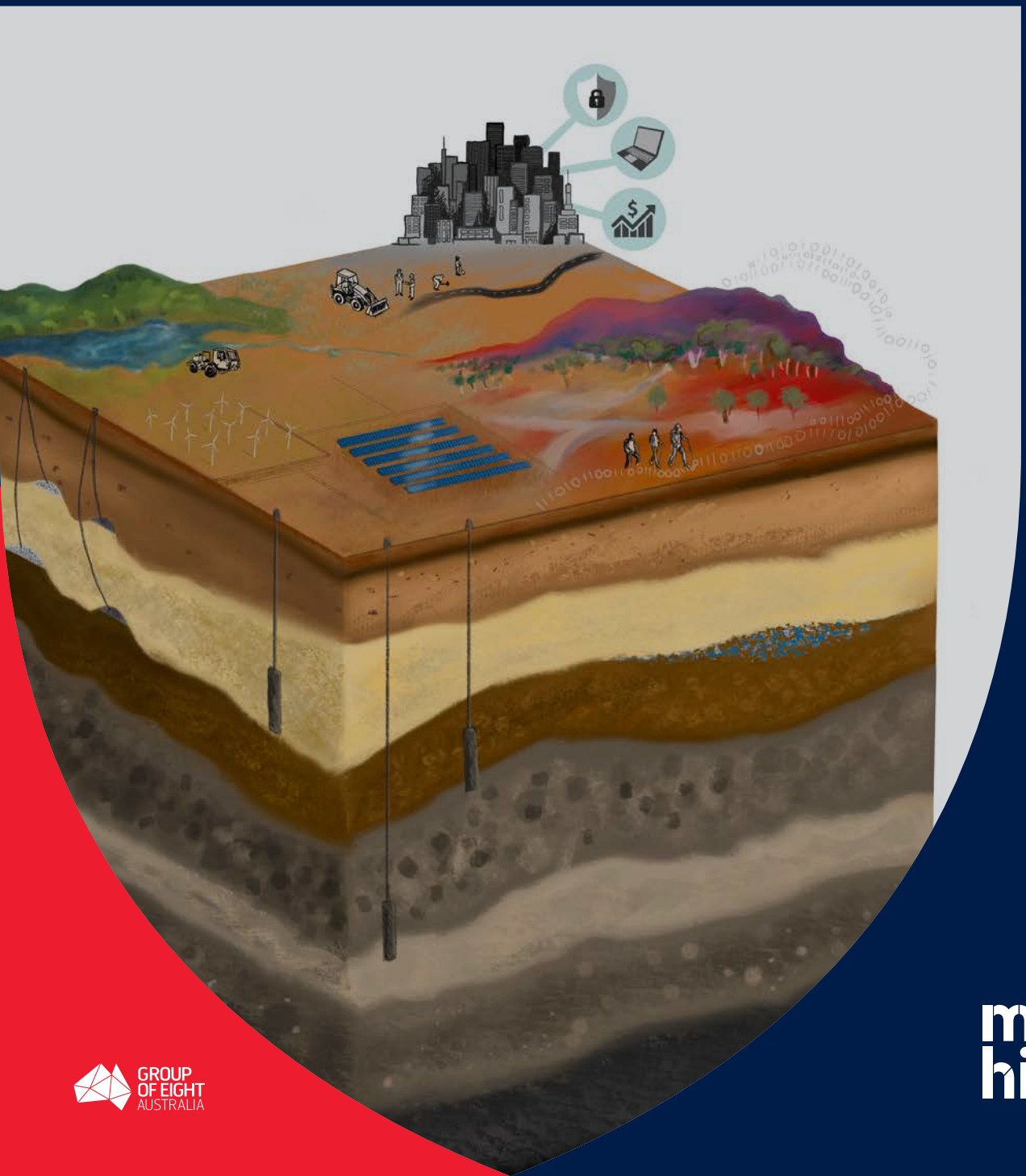
GeoEnergy Resources short courses

THE UNIVERSITY of ADELAIDE

For professionals working in oil and gas, water, CCS, hydrogen, geothermal and environmental management.



GROUP OF EIGHT AUSTRALIA

make history.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Welcome to the Australian School of Petroleum and Energy Resources (ASPER) short course prospectus, a guide to a selection of GeoEnergy Resources courses for professionals.

"GeoEnergy" is any energy resource or energy technology that interacts with the Earth's subsurface. Established industries such as oil and gas are included in this definition, as well as developing areas like geothermal energy and the storage of carbon, hydrogen and radioactive waste.

Common to all GeoEnergy activities is the involvement of fluids in the subsurface – whether by injection, extraction or some other interaction. To carry out GeoEnergy activities in a safe and sustainable manner, we must understand the fundamental geological controls on fluids in the subsurface.

Our short courses are tailored to evolving industry challenges and suited to individuals and organisations looking to build capabilities in this important subject matter.

Your goals may include:

- Exploring, appraising, developing or managing a reservoir
- Sustainably finding and producing energy products
- Optimising water delivery and use
- Transitioning to the emerging fields of carbon capture or hydrogen storage
- Decarbonisation strategies, including optimisation.

Watch Head of School Kathryn Amos on our YouTube video: www.youtube.com/watch?v=r-Kj_nx_Fco

Course enquiries

Australian School of Petroleum and Energy Resources (ASPER)
The University of Adelaide

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set.adelaide.edu.au/petroleum-and-energy-resources/

Our approach

Your needs are our priority. Our programs are designed to be flexible and client focussed. From design to delivery, we work in partnership with you.

We consult with you throughout the development and delivery of your program to ensure we understand your needs, priorities and desired outcomes.

Professional and Continuing Education (PACE) at the University of Adelaide offers professional development programs that are interactive, 'hands-on' and undertaken in a supportive adult learning environment.

Concepts are reinforced through a combination of learning methods from seminar style presentations, open discussion, case studies and scenarios, 'practice for reality' role-plays, coaching, and individual and group work. Courses can be further customised to include intensive feedback and reflection to consolidate ideas and skills.

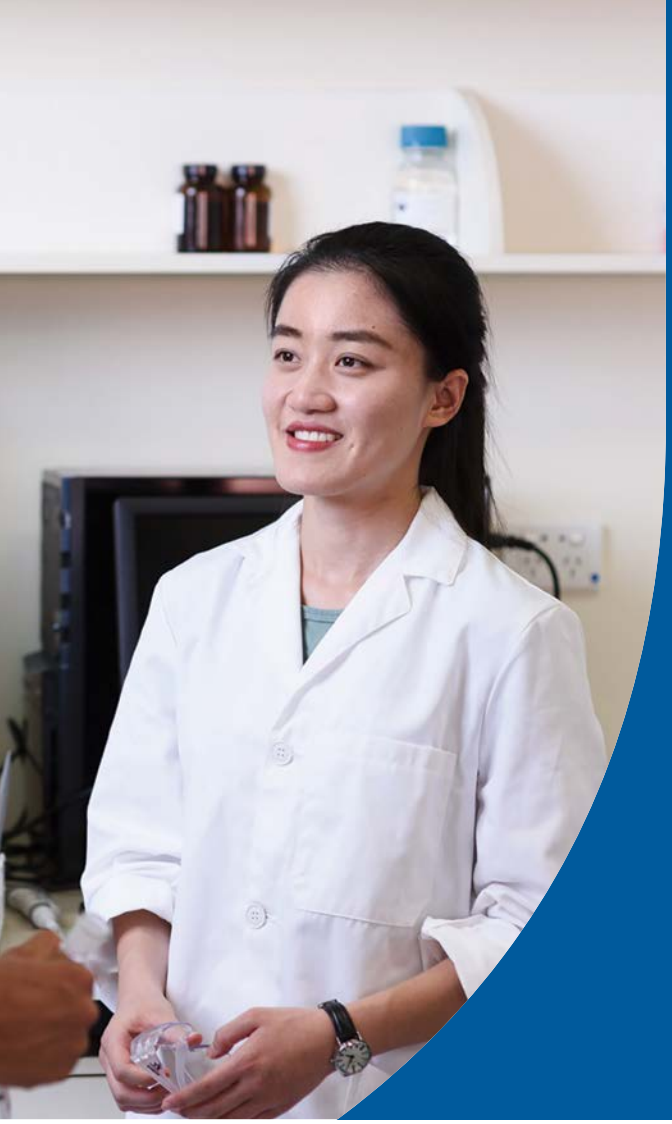
Why choose us?

Quality-assured professional training experts. Practical. Outcome focussed. Work ready. Flexible.

Why seek experts overseas when the best experts – with the best knowledge of Australian sedimentary basins – are here? The Australian School of Petroleum and Energy Resources (ASPER) is the only multidisciplinary school in Australia in petroleum, future GeoEnergy resources, and carbon and hydrogen geostorage. ASPER's home in South Australia is the nation's leading state in clean energy and sustainability.

ASPER is ranked 1st in Australia and 10th in the world in the discipline of Petroleum Engineering. Our research outputs contribute to the University of Adelaide attaining the highest possible ratings (5/5 – above world standard) in the research fields 'Resources Engineering and Extractive Metallurgy' and 'Geology' in the Australian Government's Excellence in Research Australia (ERA) assessment. Our undergraduate petroleum engineering teaching programs are accredited by Engineers Australia.

Our team is distinguished by excellence in teaching and training. Many of our staff have served as Distinguished Lecturers for professional societies such as the Society of Petroleum Engineers (SPE) (Pavel Bedrikovetski, Matthew Welsh, Steve Begg, John Kaldi) and the Geological Society of America (Peter McCabe). Others have been recognised for outstanding contributions to research, training and community service through awards and recognition from the South Australian Chamber of Mines and Energy (Kathryn Amos), Geological Society of Australia (Ken McClay, Simon Holford) and SPE (Mary Gonzalez, Abbas ZeiniJahromi, Pavel Bedrikovetski, Steve Begg).



Most of our courses are flexible

Super short (hours to a day), intensive (~1 week), and modular (2-6 week course lengths)

Remote study and face-to-face options

At your site and on our Adelaide campus

Standard and tailor-made offerings, including courses personalised to your sedimentary basin of interest

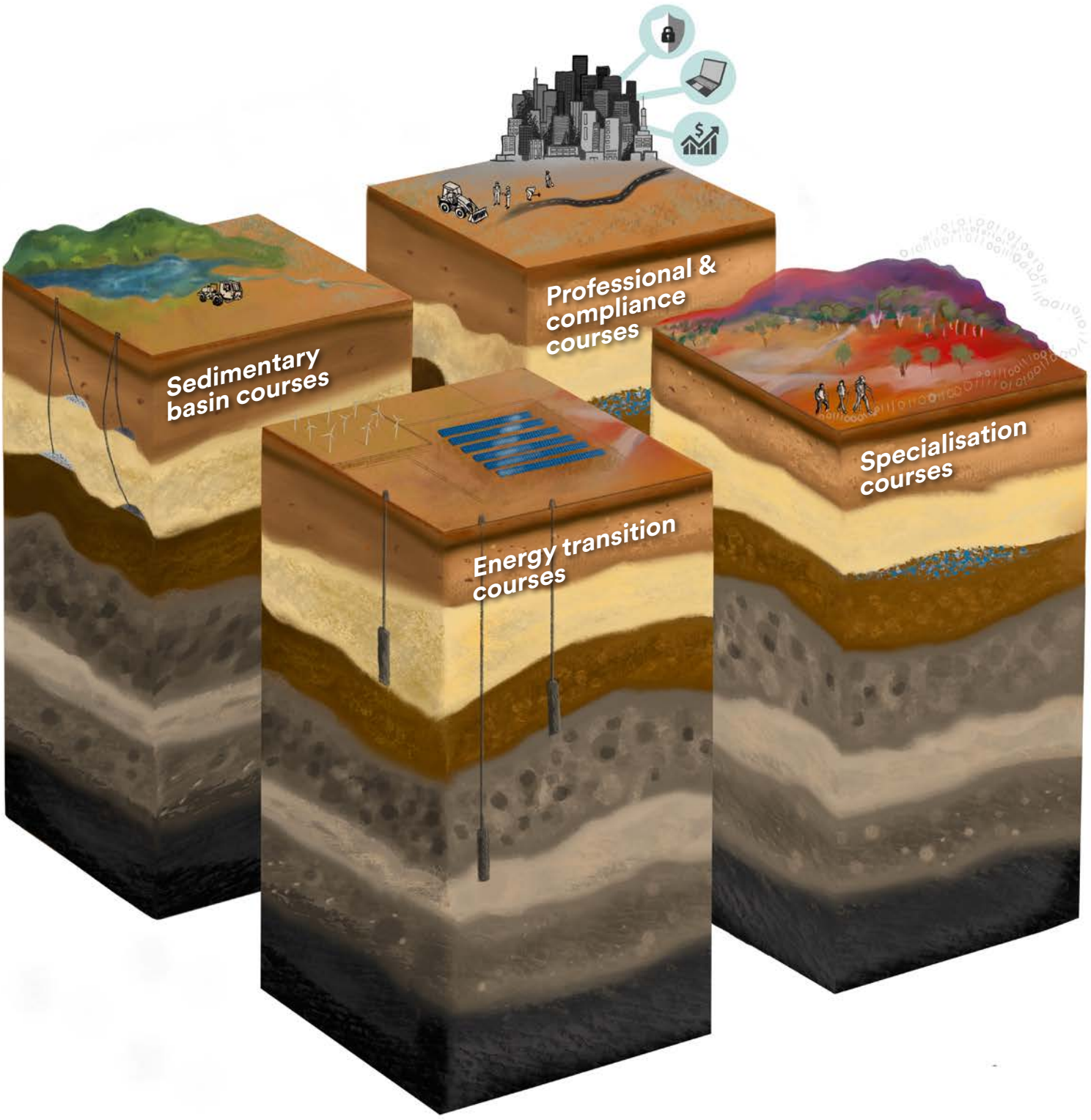
Basic to advanced course content options

Who takes our courses?

- Industry personnel such as managers, decision-makers, administrators and professional staff seeking to advance their career in a subsurface industry like oil and gas
- Geologists wanting an introduction to subsurface engineering
- Engineers wanting an introduction to reservoir geology (that is, porous and permeable rocks)
- Government staff and policy makers from mining, water and environment departments wanting a crash course in a technical topic.

Our courses are appealing to industry partners seeking to safely and efficiently produce subsurface energy resources.

We teach a growing number of people from industries transitioning to sustainable, clean energy; industries like water resources, CCS, hydrogen, and environmental management.


Sedimentary basin courses
Professional & compliance courses
Energy transition courses
Specialisation courses

Topics

Energy transition courses

Fundamentals in future energy industries that interact with the subsurface.

Page 6-7

Professional and compliance courses

Decision-making, human factors and business planning for GeoEnergy industries.

Pages 8-9

Sedimentary basin courses

Everything you need to know to explore or operate in the geological basin of your interest.

Page 10-11

Specialisation courses

Learn enough about specialist subjects to understand and act on information.

Pages 12-13

Energy transition courses

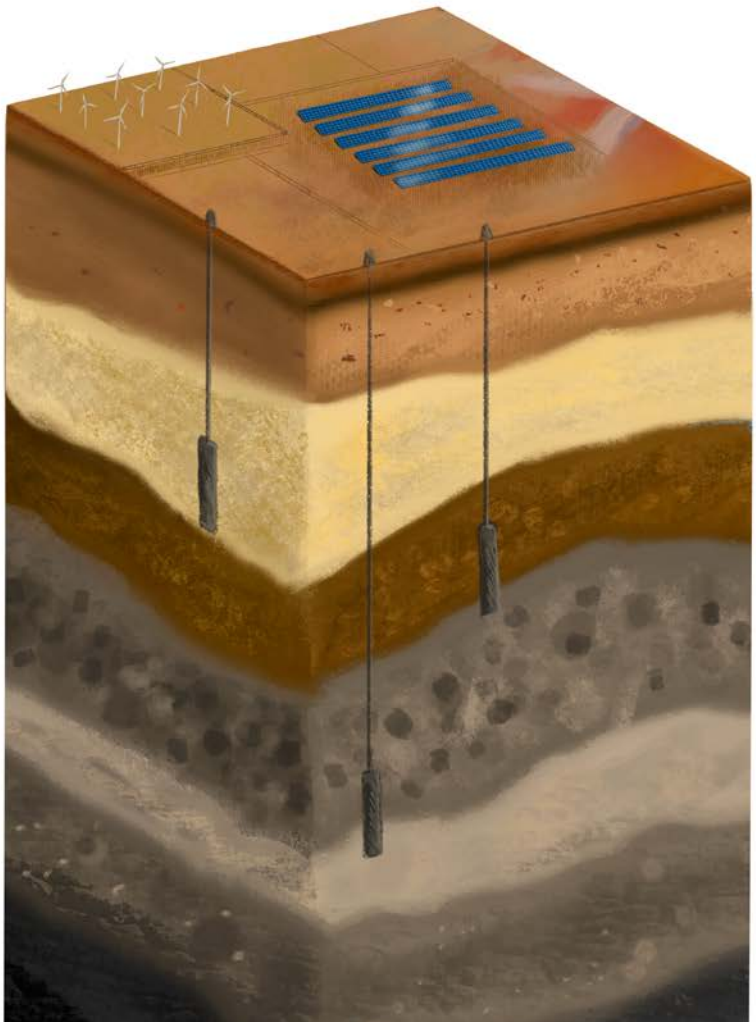
Energy transition

HALF-DAY ONLY

Looking to understand the future energy landscape and opportunities to transition your organisation? This course provides evidence-backed information, case studies and strategies for planning.

What you will learn

- Energy systems and how they are changing
- System complexities and economic viability during transition
- Limitations of new energy systems
- Energy storage options for industry
- Carbon emissions and how to select technologies to reduce them
- Decarbonising oil and gas.



Subsurface carbon storage

A plan to permanently store carbon dioxide in the subsurface starts with an assessment and characterisation of potential storage sites and systems. This course will take you through these critical steps.

What you will learn

- Fluid flow and storage in subsurface sedimentary rocks
- Geochemical and geomechanical impacts
- Reservoir modelling and engineering
- How to determine seal capacity
- Well and reservoir injectivity
- Regulations
- You can request the involvement of one of our chemical engineers to cover carbon capture at an introductory level.

Introduction to underground hydrogen storage

Hydrogen fuel can be stored in subsurface geological formations until it is needed. The goal therefore is temporary storage and recovery as a part of a future hydrogen energy value chain.

What you will learn

- Introduction to subsurface hydrogen storage, including similarities and differences to carbon storage
- How to find a storage site
- Risk assessments and WHS considerations
- Specific processes for hydrogen storage; gas migration, chemical interactions to lead to actual storage; recovery.

New laboratory

With support from Chevron Australia, ASPER is building a new experimental research facility which will help advance Australia's lower carbon future. Located at the University of Adelaide, the state-of-the-art facility will host cutting-edge research and teaching on:

- permanent carbon dioxide storage within geological formations after its injection into subsurface reservoir rocks
- how CO2 flows through and interacts with rocks and pore waters on a microscopic scale.

Tailor it

The University of Adelaide's experts in future industries such as renewable energy technologies and environmental policy and law are connected via the Institute for Sustainability, Energy and Resources (ISER) and the Stretton Institute. ASPER is working on new course formats with these institutes, and is ready to trial the following topics:

Renewable technologies for complex and heavy industries

Courses on this topic can be co-delivered by the Centre for Energy Technology and the Heavy Industry Low-carbon Transition (HILT) CRC, which specialise in renewable energy technologies for industrial processes.

Climate change and energy transition

A 10-day multidisciplinary intensive by the Stretton Institute to get you ready to plan and implement a transition. The course covers the latest scientifically-backed balanced and integrated understanding of the factors influencing and controlling climate change, and future energy utilisation scenarios. Topics include:

- climate science
- climate politics
- energy and the green economy
- energy and the energy sector
- emerging technologies
- climate change mitigation versus adaptation.

Some of our presenters

Professor Pavel Bedrikovetski

A hugely respected figure in the world of reservoir engineering and enhanced oil recovery (EOR), Pavel has recently applied his mathematical modelling expertise in fluid flow and porous media to carbon sequestration and hydrogen storage. He was Society of Petroleum Engineers Distinguished Lecturer in 2008-2009 and 2016-2017, and Distinguished Member in 2020-21. He has 40 years' industrial experience in Russia, Europe, Brazil and Australia.

Dr Ulrike Schacht

Ulrike's research and teaching expertise spans across carbon storage site selection and characterisation, natural analogue studies for carbon storage as well as monitoring and verification for carbon storage sites. She applies her skills to hydrogen storage and environmental monitoring too.

Dr Alireza Salmachi

As a specialist lecturer in the fundamentals of drilling engineering, well completion and stimulation, Alireza also applies his expertise to underground hydrogen storage, carbon sequestration in underground coal formations, and environmentally friendly drilling fluids.

Dr Sara Borazjani

Sara is a leading researcher in the mathematical modelling of two-phase flow in porous media, a complex research area with applications in petroleum, carbon and hydrogen storage, and environmental management. Recently, she has been modelling the sequestration of CO_2 in rocks deep underground.

Dr Abbas ZeiniJahromi

As ASPER's Director of Research, Abbas ensures that our people focus on top quality, industry-focussed research. His expertise is subsurface engineering with a focus on reactive multi-phase flow in porous media. Applications for his knowledge include EOR, carbon storage, and reservoir modelling.

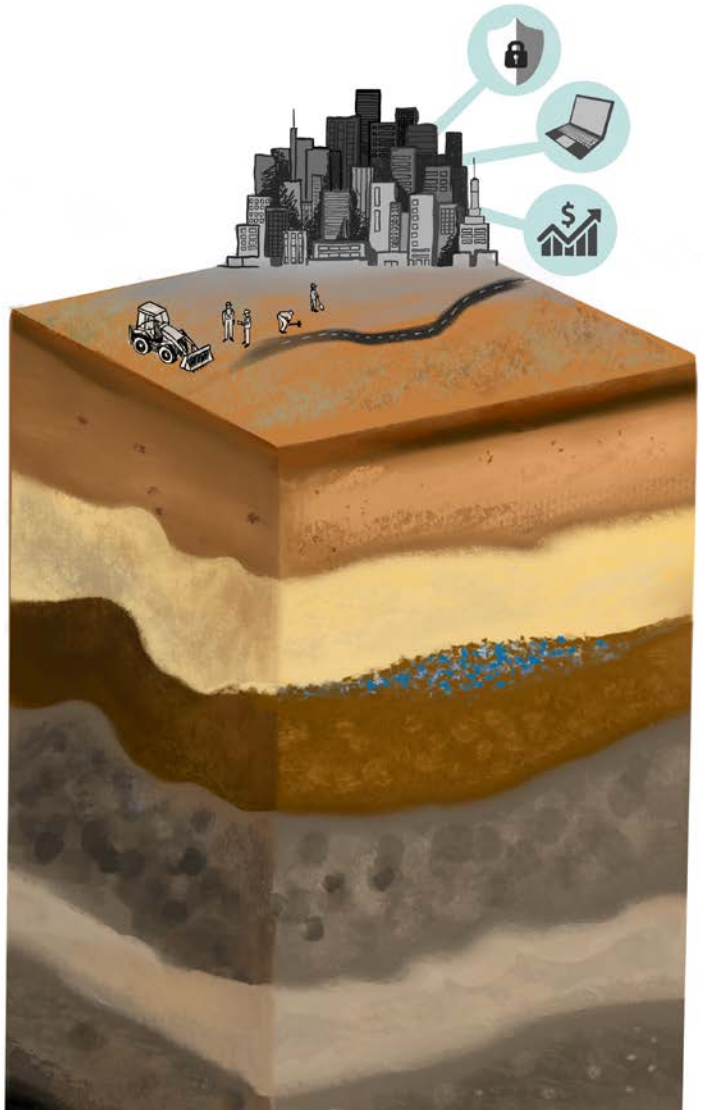
Professional and compliance courses

Decision making essentials

decision making was once linear but now it's fluid and dynamic. Staff need to be flexible and rable to eact quickly to continuous, real-time and contextual information. Many people rely on experience rather than having any formal training. This course introduces the fundamentals of decision making, combining underlying psychology with decision science and strategies.

What you will learn

- Foundational topics like judgement, estimation, forecasting
- How to define and plan for risk, uncertainty, ambiguity
- Biases in motivation, groups and cognition
- Decision analysis and monitoring methods
- Multi-criteria decision making
- Caveats for rational decision making – time and value trade-offs, and defining 'rational'.



Human factors

How do our abilities and limitations, both physical and mental, impact on our ability to perform tasks, understand procedures, and interact with devices and other people? Their effects on work performance, workplace safety and user experience make this course essential for anyone with a role in WHS, managing people or developing policies, procedures or products.

What you will learn

- Common human factors in science and engineering
- Understanding human capabilities and limitations in terms of our senses and perception
- Human-centred design and how this affects the useability of objects and equipment
- Safety considerations, such as fatigue and cognitive load
- Cybersecurity and human psychology
- Autonomous agents.

> **Matthew was an absolutely engaging tutor! One of the best I have had at university so far. He is truly an asset to the university teaching staff."**
>
> **Student Testimonial** 2021

GeoEnergy business and project economics

The role of engineers and geologists is to support the business objectives of an organisation. Economic evaluations feed into investment and operational decisions. There are many subtleties to business strategy and economic calculations, and understanding the concepts behind them helps everyone in the organisation to make better choices.

What you will learn

- GeoEnergy business context
- Economic and business concepts, including money time-value
- Cash-flows and GeoEnergy fiscal regimes
- Net present value and other economic metrics
- Case study and portfolio management.

Some of our presenters

Dr Matthew Welsh

Matthew has worked with ASPER for 20 years, researching and consulting on human decision making in industry. He has worked with multi-national oil companies, medical research groups, defence, and police. He is a 2020-21 Society of Petroleum Engineers Distinguished Lecturer on how cognitive science can help industry decision making, and author of Bias in Science and Communication: A Field Guide.

Maria Gonzalez Perdomo

Mary is ASPER's Director of Teaching and Coordinator of the Petroleum Engineering Program. Before joining ASPER, she worked for several years in the oil and gas industry in subsurface and production engineering. Her specialties are hydraulic fracturing, data analytics including deep learning, and production optimisation.

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Tailor it

Through our tailored training services we have the capacity to manage large programs and the flexibility to be innovative and responsive to your needs.

You can, for example, access world-leading expertise in other parts of the University of Adelaide, including legal, environmental, business, organisational psychology, and physical sciences specialists.

Don't see your area of interest? Get in touch with us at asper@adelaide.edu.au

Sedimentary basin courses

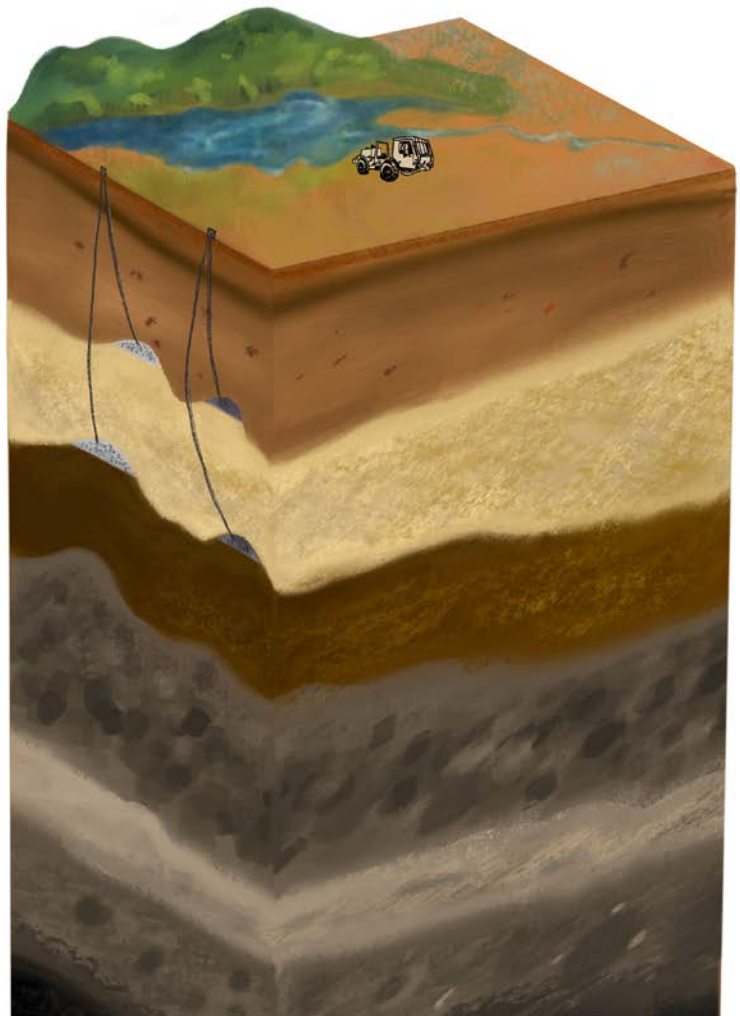
Get to know your basin

if your organisation has an interest in a particular sedimentary basin, this course is for you. You pick the basin, we provide you with an overview.

Some of Australia's key basins for subsurface industries include the Cooper, Bowen, McArthur, Browse, Carnarvon, Otway, Gippsland, and Eromanga.

What you will learn

- History of exploration and production in the basin of your choice
- Geological evolution, and understanding of why the basin is there
- Key elements of the basin such as seals and reservoirs
- Production infrastructure elements, such as pipelines and access to markets
- Potential for energy transition industries, such as hydrogen and carbon storage.



Introduction to petroleum engineering

also known as 'Engineering for Geologists', this course is for anyone not qualified in petroleum engineering but needing to understand the basics.

What you will learn

- Petroleum drilling, completions and production
- Reservoir mechanics
- Fundamentals of rock and fluid properties
- Composition and PVT properties of petroleum fluids
- Basic physical and chemical properties of petroleum reservoir fluids related to reservoir processes and production.

> **"Simon is very passionate, enthusiastic and knowledgeable, gives great explanations and wants his course participants to succeed."**
>
> **Student Testimonial** 2020

Sedimentary basins: a guide for mineral explorers

this course is for mineral industry professionals seeking to better understand the origin and structural and stratigraphic architecture of sedimentary basins in order to explore for sedimentary-hosted mineral deposits, including base metals, uranium and critical minerals.

What you will learn

- How sedimentary basins form
- Geophysical and geological approaches to subsurface characterisation
- Global, regional, and local-scale controls on basin-filling processes
- Controls on fluid flow in sedimentary basins
- Similarities and differences between petroleum and mineral systems.

Some of our presenters

Professor Simon Holford

Simon is Deputy Head of ASPER and a sought-after lecturer and supervisor in sedimentary basins, with particular interests in basin evolution, volcanic rocks, and structural permeability including fault stability during carbon and hydrogen injection. Simon has won multiple awards for his contributions to knowledge on Australia's sedimentary basins from professional societies (GSA, ASEG) and industry (APPEA).

Dr Rachelle Kernen

Rachelle is a geoscientist with an industry background in both petroleum and mining exploration, including deepwater seismic interpretation and copper exploration in sedimentary deposits. Rachelle has expertise in salt-sediment interaction, intrasalt stratigraphy, deformation, and caprocks, with a growing focus on the subsurface storage of CO_2 and hydrogen.

Dr Khalid Amrouch

Khalid integrates geomechanical, petrophysical and structural techniques to better understand the evolution of the upper crust deformation and related mechanics, the geo-fluids migration, and their mechanical effect on rocks through time and space. He is an expert in brittle deformation and 4D stress analysis, and applies this expertise to understand the subsurface from microscopic to whole-of-basin scales.

Dr Mark Bunch

With skills in digital rendering of past landscapes and features preserved in the subsurface, Mark brings sedimentary basins to life in engaging and informative ways. From him you will learn about interpreting seismic data, reservoir modelling and locating potential gas storage sites.

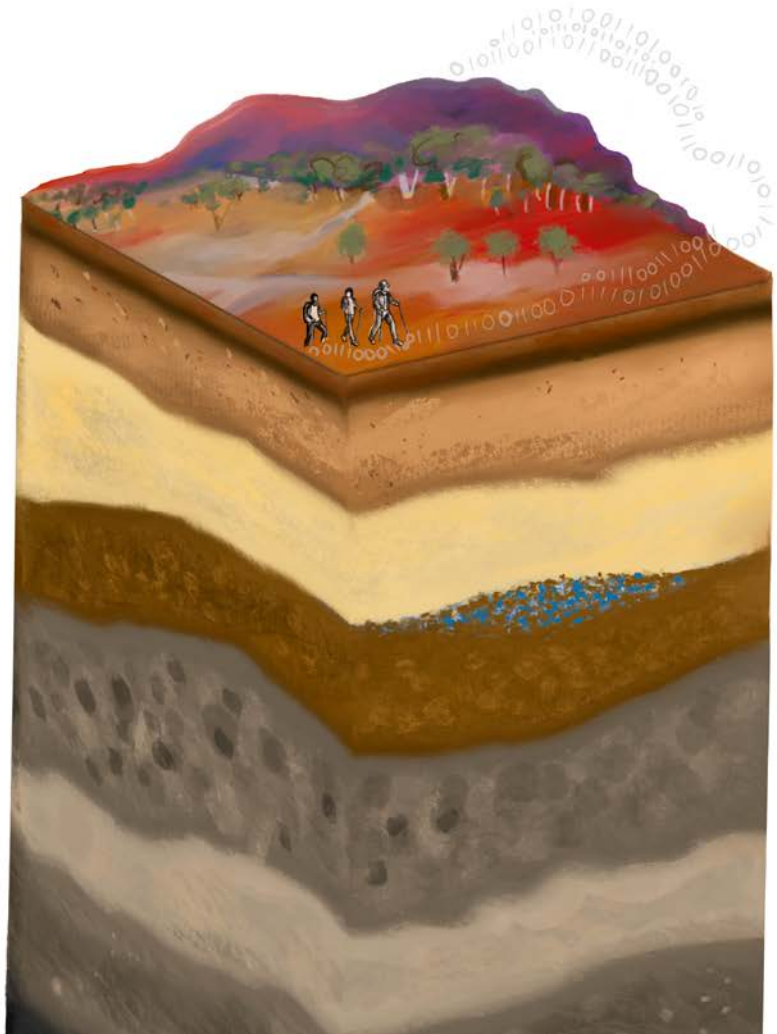
Specialisation courses

Data analytics for GeoEnergy Resources

What are the real benefits of data analytics? Let us guide you through the opportunities, challenges, and applications. This course includes theory and practical methods, including real field examples to equip you to apply data analytics and machine learning methods in the workplace.

What you will learn

- Basic artificial neural networks
- How to perform data clustering, feature extraction, and classification
- How to describe the fundamentals of Descriptive and Predictive Analytics
- How to choose the most appropriate machine learning and data analytics models
- Python basic commands and dealing with specialty data types
- Python most popular libraries for petroleum engineering data analytics.



GeoEnergy resource evaluation

Best practice resource evaluation brings together the disciplines of geology, geophysics, and reservoir engineering in a way that allows you to make decisions.

What you will learn

- How to use basic geological and engineering data to evaluate reservoir rock quality, fluid saturations and contact depths, transition zone thickness and seal capacity
- Geostatistics as a probabilistic approach to modelling the subsurface
- Introduction to reservoir engineering, including rock and fluid properties
- Introduction to decision making under uncertainty
- Unconventional resources including shale gas and oil, coal seam gas and tight gas.

Transport and properties of porous media

Encompassing all aspects of flow and properties of porous media, natural porous reservoirs and artificial porous materials, this course has applications to chemical, environmental, mining, medical, and mechanical engineering.

What you will learn

- Fundamentals of flow and deformation phenomena in natural and industrial porous systems
- Methods for laboratory analysis and mathematical modelling
- Application to a broad range of topics including aquifer contamination, waste disposal, hydrocarbon migration, and fines migration in geological formations.

Choose from Basic to Advanced levels for any of our specialisation courses.

Field trip: outcrop reservoir analogues of the Flinders Ranges, South Australia

Nothing replaces a hands-on field trip to really understand sedimentology and stratigraphy. This popular course includes a basic introduction to field geology and sedimentologic logging, followed by a deep dive on:

- interpretation of past depositional environments
- sedimentologic and structural controls on deposit geometry, architecture and connectivity
- stratigraphy and sequence stratigraphy
- reservoir properties, heterogeneities, and controls on fluid flow.

We compare how outcrop features in the Flinders Ranges would be expressed in subsurface well and seismic data. Each day is spent in the field, with group exercises, tutorials and discussions. Evenings are often filled with discussions and workshops.

The Flinders Ranges is special because it has easily accessible, world-class outcrop geology that is equivalent to geology in other areas. It is also a world-class site of natural beauty and a tourism destination.

See a sample Flinders Ranges Field Trip itinerary online: ecms.adelaide.edu.au/petroleum-and-energy-resources/study-with-us/short-courses

Other available field trips

Our team has extensive experience running trips in Otway Basin, Lake Eyre Basin, Amadeus Basin and others.

We have many more specialisation courses. Check out our website.

set.adelaide.edu.au/petroleum-and-energy-resources/study-with-us/what-is-petroleum-engineering

ASPER has world-leading experts in technical themes like Subsurface Geology, Geomechanics, Drilling Engineering, Production Engineering, Enhanced Oil Recovery and more. We teach advanced courses on these topics on an annual basis through our prestigious coursework Master programs in engineering and energy geoscience. These are taught in short course format, and are open to external participants.

Some of our presenters

Associate Professor Kathryn Amos

Kathryn is Head of School at ASPER. Her expertise is in clastic sedimentology, with research focusing on understanding the controls behind processes of sediment transport and deposition in a range of environments, using information from both modern environments and the rock record. Kathryn is a highly engaging presenter and leads the Flinders Ranges field trip.

Dr Mohammad Sayyafzadeh

With qualifications in chemical, reservoir and petroleum engineering, Mohammad has unique, multidisciplinary specialist expertise. He is also a skilled computational mathematician and applies machine learning and uncertainty quantification to optimise field development.

Associate Professor Manouchehr Haghighi

Manny has more than 30 years' experience working in integrated reservoir simulation, unconventional resources, CO_2 sequestration and machine learning. Prior to joining ASPER, Manny spent 15 years in industry, with his most recent roles including directing integrated reservoir simulation studies.

Dr Thomas Russell

Thomas performs novel research on fluid flow and formation damage in porous media, using mathematical modelling and laboratory experimentation to assist enhanced oil and gas recovery and the injection and storage of CO_2.

Further enquiries

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Kaurna acknowledgement
We acknowledge and pay our respects to the Kaurna people, the original custodians of the Adelaide Plains and the land on which the University of Adelaide's campuses at North Terrace, Waite, and Roseworthy are built. We acknowledge the deep feelings of attachment and relationship of the Kaurna people to country and we respect and value their past, present and ongoing connection to the land and cultural beliefs. The University continues to develop respectful and reciprocal relationships with all Indigenous peoples in Australia, and with other Indigenous peoples throughout the world.