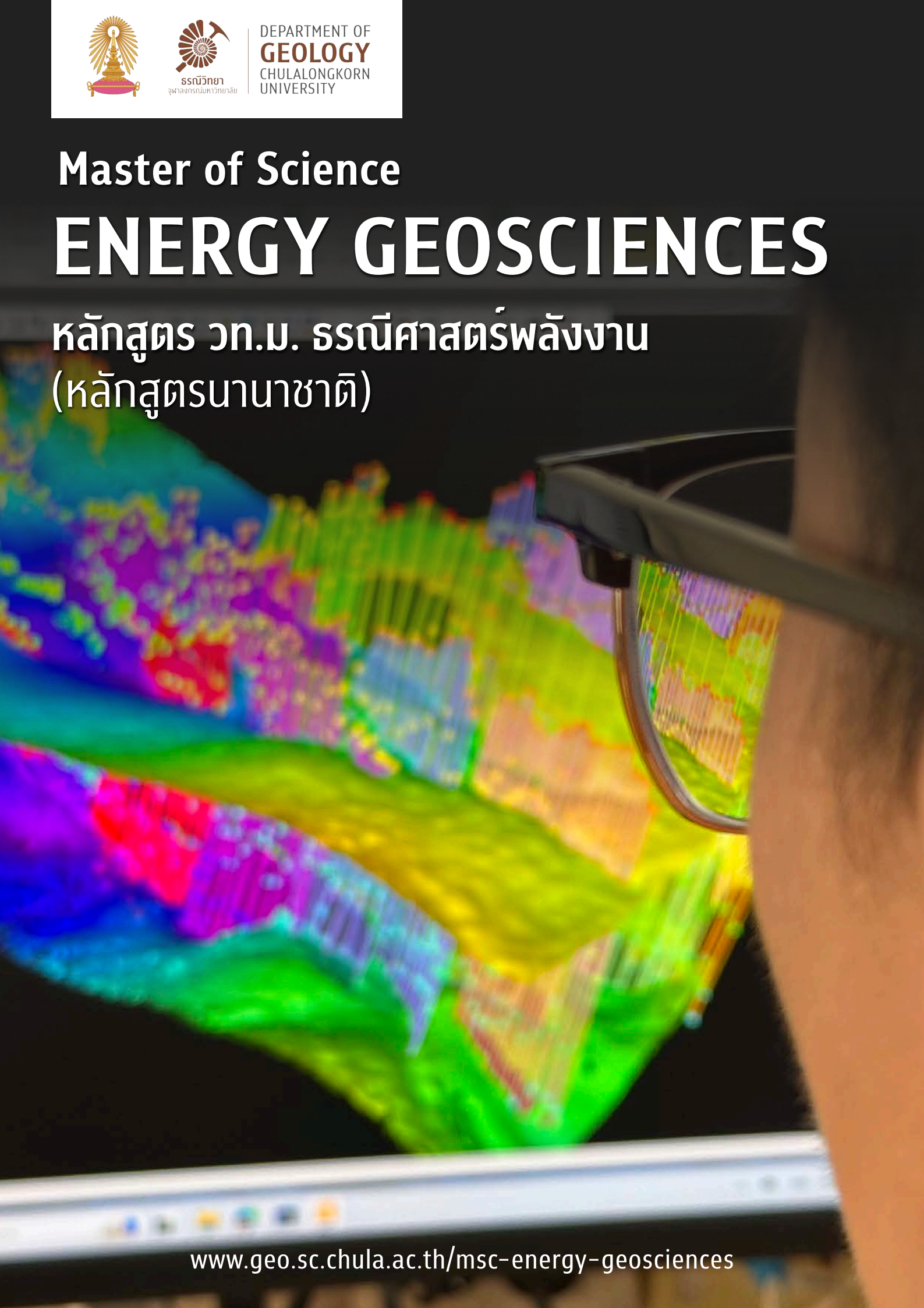
DEPARTMENT OF
GEOLOGY
CHULALONGKORN
UNIVERSITY

ธรณีวิทยา
จุฬาลงกรณ์มหาวิทยาลัย

Master of Science
ENERGY GEOSCIENCES
หลักสูตร วท.ม. ธรณีศาสตร์พลังงาน
(หลักสูตรนานาชาติ)



www.geo.sc.chula.ac.th/msc-energy-geosciences

Key information

Degree awarded
M.Sc. in Energy Geosciences

Curriculum code:
4675 for Study Plan A
4676 for Study Plan B

Trimester system:
3 semesters per academic year

Duration:
Study Plan A – 18 months full-time
Study Plan B – 12 months full-time

Fees (per semester):
Thai students 33,500 THB
International students 93,500 THB

หลักสูตรปรับปรุง (พ.ศ.2566)
ผ่านการรับรองจากสำนักงาน ก.พ.
เลขที่อ้างอิง 2426

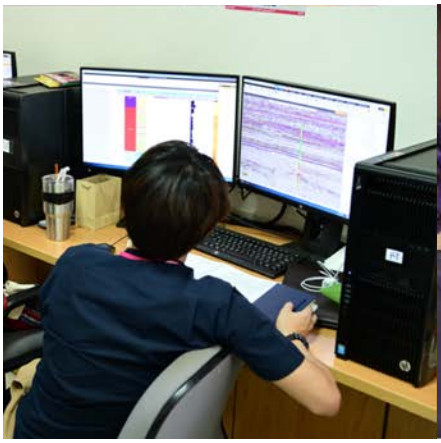
Course overview

The MSc in Energy Geosciences at Chulalongkorn University is a postgraduate program that focuses on the study of the geological aspects of energy resources in the energy transition.

The program aims to equip students with the knowledge and skills necessary to understand the geology of energy resources for a low-carbon future, as well as the environmental and economic implications of their extraction and use.

Our program provides students with a broader understanding of energy resources, including not only fossil fuels but also renewable energy sources such as geothermal, wind, and solar energy.

Our teaching also provides students with the latest knowledge and tools necessary to keep up with these advancements and work with cutting-edge technologies. This allows graduates to pursue careers in a wider range of industries, including not only oil and gas but also renewable energy, environmental consulting, and mining.



Admission information

Applications are accepted from February – April

Online application form www.register.gradchula.com

Document Requirements

1. Official transcripts and degree certificates
2. One letter of recommendation
3. Personal statement
4. Proof of English proficiency

Entry requirements

- Applicants must hold a high-quality degree in Geology, Geoscience, Earth Science, Geotechnology, Geophysics, or a related field.
- Applicants must have a TOEFL score of at least 475 (paper-based) or an equivalent TOEFL score of 475 or an IELTS score of 4.5. Alternatively, a CU-TEP score of 57 is acceptable.
  Visit www.atc.chula.ac.th for CU-TEP test schedule.
- A degree in a closely related subject with relevant work experience will also be considered.

Scholarships

Three scholarships are available for both Thai and international students in **Study Plan B** (3 semesters).
The scholarships are competitive awards worth 100% of tuition fees.

Interview process and final decision will be made in May.

Contact details

Assistant Professor Dr. Sukonmeth Jitmahantakul

Department of Geology, Faculty of Science, Chulalongkorn University, Bangkok 10330 Thailand
Email: Sukonmeth.J@chula.ac.th

Program structure

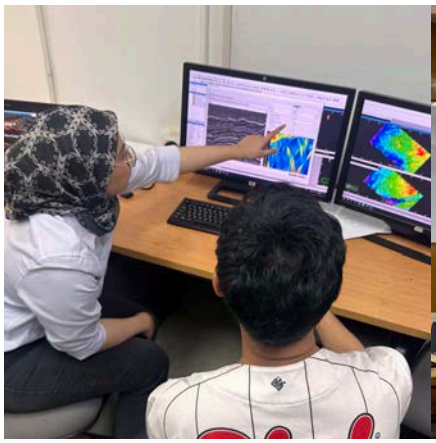
In **Semester 1**, students will develop technical, analytical, and digital skills through **compulsory courses**, covering:

- **Virtual Geoscience** – Digital tools and visualization techniques for geoscience applications.
- **Applied Structural Geology** – Structural analysis for energy exploration and subsurface modeling.
- **Carbonate Rocks** – Characteristics, diagenesis, and reservoir potential of carbonate rocks.
- **Clastic Rocks** – Depositional systems, reservoir properties, and exploration strategies.
- **Geophysics** – Seismic interpretation, potential field methods, and subsurface imaging.
- **GIS for Earth Science** – Spatial data analysis for resource management and exploration.
- **Earth Resources and Environment** – Exploration, sustainability, and environmental impact of resource extraction.

In **Semester 2**, students will choose **elective courses** based on their interests and career goals in hydrocarbon exploration, renewable energy, and the evolving low-carbon energy industry. This semester provides flexibility to specialize in areas such as Carbon Capture and Storage (CCS), geothermal energy, and basin modeling, aligning with current industry trends.

All learnings from **Semesters 1 and 2** will culminate in an **independent project and dissertation** in **Semester 3 (Study Plan B) or Semester 4 (Study Plan A)**, allowing students to apply their skills to real-world energy exploration challenges. A **geological field study** will also be conducted in **Semester 3** to provide hands-on experience in energy geoscience.

Throughout the year, students will engage with **industry experts and guest speakers**, gaining insights into the latest **projects, internships, and career opportunities** in the energy sector. These engagements will provide a firsthand understanding of professional geoscience careers in **energy exploration, resource management, and emerging low-carbon technologies**.



Study plan A (Curriculum code: 4675)

18 months	Course no.	Course title	Credits
Semester 1	2307597	GIS for Earth Science	3
	2351546	Virtual Geoscience	2
	2351547	Earth Resources and Evironment	2
	2351554	Applied Structural Geology	2
	2351559	Carbonate Rocks for Petroleum Exploration	2
	2351569	Clastic Rocks for Petroleum Exploration	2
	2351602	Geophysics	2
Semester 2	**Elective courses** (A minimum of 7 credits)		7
Semester 3	2351611	Graduate Seminar	0
	2351614	Geology Field Study	2
	2351811	Thesis	6
Semester 4	2351811	Thesis	6
		Total credits	**36**

Study plan B (Curriculum code: 4676)

12 months	Course no.	Course title	Credits
Semester 1	2307597	GIS for Earth Science	3
	2351546	Virtual Geoscience	2
	2351547	Earth Resources and Evironment	2
	2351554	Applied Structural Geology	2
	2351559	Carbonate Rocks for Petroleum Exploration	2
	2351569	Clastic Rocks for Petroleum Exploration	2
	2351602	Geophysics	2
Semester 2	**Elective courses** (A minimum of 13 credits)		13
Semester 3	2351611	Graduate Seminar	0
	2351614	Geology Field Study	2
	2351618	Individual Study	6
	2351896	Comprehensive Examination	0
		Total credits	**36**

Compulsory courses

Course no.	Course title and description	Credits
2307597	**GIS for Earth Science** Geographic information systems: types of spatial and non-spatial data in earth science, GIS database development, data structure, data capturing and management, GIS data analysis and modeling , GIS softwares and contribution of remote sensing to GIS	3
2351546	**Virtual Geoscience** 360-degree photography; digital outcrop modelling; structural and stratigraphic analysis of digital outcrop models; development of virtual environment; geological presentation using virtual technologies	2
2351547	**Earth Resources and Environment** Introduction; human and earth resources; metal deposits; non-metal deposits; geology and alternative energy; water resources; soil resources; environmental impact in geology	2
2351554	**Applied Structural Geology** Basic concept of structural geology; ductile deformation; brittle deformation; applications to topography and landforms, earth resources, geotechnology, geohazards	2
2351559	**Carbonate Rocks for Petroleum Exploration** Definition of carbonate rock, carbonate reservoir rock; carbonate rock classification; carbonate reservoir rock properties; carbonate rock deposition; sequence stratigraphy; diagenesis; fractured carbonate reservoir rock and fracture classification	2
2351569	**Clastic Rocks for Petroleum Exploration** General introduction about depositional systems; facies models of clastic rocks; the importance of clastic rocks for petroleum exploration; fluvial and alluvial depositional systems; lacustrine depositional system; shallow marine depositional system; delta depositional system; deep water depositional system; the importance of clastic rocks as reservoir, seal and source rocks	2
2351602	**Geophysics** Description of waveforms, propagation of seismic waves, data acquisition, digital signal analysis, data processing, seismic interpretation in time, time to depth conversion, 3D data acquisition and processing, seismic modelling, synthetic seismograms, VSP, seismic stratigraphy, seismic refraction methods, interpretation of gravity and magnetic data	2
2351611	**Graduate Seminar** Report or paper presentation, criticism of discussion on energy geosciences	0
2351614	**Geology Field Study** Field study of Geology, structure and stratigraphy of petroleum basin	2

Elective courses

Course no.	Course title and description	Credits
2307501	**Basin Analysis** Classification schemes of sedimentary basins; physical state of the lithosphere; basin formations due to lithospheric stretching; basin formations due to flexure of lithosphere; effects of mantle dynamics; basins associated with strike-slip deformation; sediment routing system; basin stratigraphy; subsidence and thermal history; application to petroleum play assessment	3
2307572	**Introduction to Petroleum Geology** Chemistry, occurrence and origin of petroluem; source rocks, reservoir rocks, migration and traps; exploration and production methods, petroleum provinces of the world	3
2307574	**Hydrological Science** Water and energy cycles; oceanic and atmospheric circulation and the greenhouse effects; rainwater and atmospheric chemistry; groundwater; rivers, lakes, estuaries, and the oceans	3
2307588	**Machine Learning for Geosciences** Introductory Python for geosciences; mathematical optimization: first-order optimization techniques, second-order optimization techniques, linear regression, linear two-class classification, principles of feature learning, kernel methods, time-series forecasting, and Gaussian process regression; geological research projects	3
2307589	**Deep Learning for Geosciences** Introductory Python for geosciences; partial derivative for deep learning; algebra for deep learning; multilayer perceptrons; backpropagation; automatic differentiation; stochastic gradient descent; convolutional neural networks; residual networks; gated recurrent units; geological research projects	3
2307622	**Advanced Sedimentology** Detailed study of selected topics such as various sedimentary environments, geometry of sedimentary bodies, diagenesis, clay geology	3
2307623	**Sedimentary Petrography** Petrography of carbonate rocks, sandstones, and mudrocks; determination of heavy mineral assemblages sedimentological synthesis of petrographic studies	3
2307624	**Geology of Southeast Asia** Geological evolution of Southeast Asia, lithostratigraphic correlation and interpretation, important geological resourecs, and geological problems	3
2351548	**Geothermal Resources** Energy system of the earth; basic concept of geology; geothermal system; geothermal exploration techniques; geothermal resource management; thermal energy of the oceans; geothermal resource utilization; worldwide geothermal resources	2

2351555	**Applied stratigraphy** Basic concepts and evolution of stratigraphic concepts, chronostratigraphy as a research tool and case studies; analyzing and sequencing the record; taphonomy and applications; significance of ichnofossils; biosteering and hydrocarbon reservoir exploitation; microfossils; applied microfossil biostratigraphy	3
2351595	**Rare Earth Element Exploration** Definition and genesis of rare earth elements (REE); classification and chemical characteristics of REE; essential REE deposits and REE potential in Thailand; REE separation; significance of REE; REE exploration	2
2351601	**Petroleum Reservoir Sedimentology** Fluid flow, sediment transport mechanisms, bedforms and sedimentary structures associated with open channel flow, sedimentary gravity flows and waves; depositional environments and facies models for clastic sedimentary systems; composition, classification and facies models for carbonate rocks; compaction, diagenesis, cementation and dissolution of clastic and carbonate rocks and their effects on porosity and permeability of hydrocarbon reservoirs	3
2351603	**Tectonic and Structural Geology** Fault and fold mechanics, current concepts in plate tectonics, cross-section construction techniques, structural interpretation of seismic data, structural styles in different tectonic settings: thrust and fold belts, rifts, strike-slip, gravity tectonics, inversion; structural geology of reservoir units	3
2351604	**Well Log Analysis** Well and borehole environments; Archie equation; gamma ray log, spontaneous potential log, temperature log, resistivity log, density log, neutron log, sonic log; borehole imaging; clean and shaly sand formation evaluation: lithology, fluids, saturations; producibility: porosity, permeability, effective permeability; specialty logs: epithernal, nuclear resonance; cased-hole log; log quality control; logging for structural and stratigraphic correlations; reservoir formation evaluation	2
2351605	**Seismic Interpretation** Principles of geological interpretation of seismic reflection data: structural interpretation, seismic stratigraphy, seismic facies analysis, lithofacies prediction, reconstruction of complex depositional/erosional signals in various environments, integration of seismic and well data; interpretation of 2D and 3D data by using computer in a workstation environment	3
2351606	**Petroleum Geochemistry** Basic concepts and terminology of petroleum geochemistry; processes related to preservation of organic matter in sedimentary environments; composition and characterization of kerogen, bitumen and petroleum; conversion of kerogen to hydrocarbon; principles and interpretation of geochemical data; basic concepts of maturity modelling; integrating measured geochemical data with conceptual geologic models; modelling of burial and thermal history and prediction of hydrocarbon generation and migration routes	2

2351607	**Sequence Stratigraphy** Definition of depositional sequence; recognition of depositional sequences on well logs, seismic data and outcrop; factors controlling on sequence development; systems tracts; seismic facies analysis; eustasy versus tectonics; application to basin evaluation and field-scale correlations	3
2351608	**Applied Biostratigraphy** Palynomorphs: spores and pollen, dinoflagellates; benthic and planktonic foraminifera; calcareous nanofossils; biozonation of the Tertiary of Southeast Asia; global biozonations; sequence stratigraphic applications; role of biostratigraphy in exploration	1
2351609	**Petroleum Exploration** Indentification and mapping of structural and stratigraphic traps from seismic data; prediction of trap integrity; volume estimation of hydrocarbon accumulations; application of facies models and sequence stratigraphy to estimation of reservoir grometry and quality; tectonic and subsidence models for passive continental margins; fold and thrust belts; rift and pull-apart basins; basin inversion; analysis of basin development for determining hydrocarbon source rock potential and migration pathways; integration of technical data with economic principles and risk assessment in making exploration decisions; developing exploration strategies	2
2351610	**Reservoir Characterization** Recovery factors in hydrocarbon reservoirs; petrophysics in oil field environment and scaling to appropriate earth models; linking rock physics, well logs and seismic data to extend rock properties measure in borehole into data volume given by 3D seismic data; measuring 3D earth models using borehole seismic; vertical seismic profiling (VSP); cross well and single well techniques; seismic facies modeling; seismic inversion; geostatistical modeling; DHIS and AVO analysis; seismic attributes application; shear wave data application; 4D seismic application; cross-well profiling/seismic tomography; understanding physical properties of rocks and their importance for different applications: reservoir modeling and petroleum engineering	3
2351612	**Prospect Assessment** Interpretation of geophysical data: well,outcrop, seismic and other data to evaluate exploration potential of area; simulating types of interpretations and decisions made in oil industry for exploration projects	2
2351613	**Integrated Oil and Gas Field Study** Concepts and terminology applied to integrated oil and gas field analysis; application of geological and geophysical data: correlation, mapping, compilation of seismic and well-log data of structural, stratigraphy, reservoir facies in map forms; calibration of well logs to core and cutting data; calibration of well logs to seismic data; generating geological and reservoir maps; calculating oil and gas reserves; history matching field production	2

Individual Study and Thesis

Each student is required to design and conduct an independent research project, integrating geological and/or geophysical data collection, analysis, and interpretation. The research findings will be presented in both a written thesis and an oral defense at the end of the project.

Students can choose from a diverse range of energy-related research topics, covering both surface and subsurface geological and geophysical challenges. Thailand and the ASEAN region provide exceptional research opportunities in clastic and carbonate sedimentology, structural analysis, and reservoir geology.

Students are encouraged to select a research topic that aligns with their interests and may also propose projects based on geological challenges in their home country.

To fulfill graduation requirements, each student must publish at least one research article in an international journal.

Career opportunities

The energy sector remains one of the largest employers of geoscience graduates, offering strong career prospects in Thailand and internationally across energy industry, service providers, government agencies, and academia.

Graduates of the MSc Energy Geosciences program are well-equipped to contribute to the evolving energy landscape, including hydrocarbon exploration, geothermal energy, carbon capture and storage (CCS), and sustainable resource management.

As part of their research projects, students may have the opportunity to collaborate with industry sponsors, gaining valuable hands-on experience in energy companies and research institutions. The MSc program has a strong track record of employability, with alumni securing roles in both traditional and emerging energy industries.

Energy Geosciences at Chulalongkorn University maintains well-established connections with the energy sector. Industry professionals are regularly invited as guest speakers, and the teaching team includes experienced external lecturers who are active in the energy industry, bringing significant expertise and professional networks to the program.

"After he completed his master's course at Chulalongkorn University, I observed significant improvements in his ability to create and present geological maps—they are now more detailed and easier to understand. Additionally, his critical thinking skills have increased."

Conrad O.
Principal Geologist
Ropa Investments (Gibraltar) Limited

Employer Satisfaction Survey
October 2024

AAPG Imperial Barrel Award
A Joint Program of AAPG and the AAPG Foundation

SemiFinals 2nd Place
Chulalongkorn University
Asia Pacific Region - Thailand

Participation in the 2024 AAPG's Imperial Barrel Award Program (IBA) Asia Pacific semifinals

Empowering the next generation of energy geoscientists for a sustainable, low-carbon future

- MSc Energy Geosciences -
Chulalongkorn University