



Chemical Engineering

Integrated Hydrogeology and Sustainable Water Management (CENG0060)

Description

Water is essential in the energy and resources sector because it is used to extract and process hydrocarbons (both conventional and unconventional) and minerals. In the oil and gas industry, water is critical for production, being required for drilling and hydraulic fracturing as well as in petroleum refining, often relying on freshwater withdrawal from rivers, lakes and aquifers. The mining sector relies on water for various operations including mineral processing, dust suppression and slurry transport, also relying on water procurement from groundwater, rivers, streams and lakes. These activities could lead to water scarcity and possible contamination, although in some cases an excess of water is also produced during certain mining operations, which need to be properly disposed of. Availability of water supply as well as groundwater table drawdown are of particular concern. As the water cycle contributes to disperse the contaminants present to large distances, water purity and availability directly affect the communities where operations occur, as well as those further away.

This module will provide a quantitative understanding of the hydrologic cycle, will identify the properties of water as a natural resource, will describe the aspects of the integrated water resource management, as well as the engineering related to water purification processes. The module will recognise socio-economic factors that impact effective water solutions, including urban infrastructure projects and managed urban infrastructure. Models for water transport in the subsurface (hydrogeology) will also be discussed, specifically in relation to the resources sector with focus on the pressure on groundwater quality and quantity, relating to appropriate measures to preserve or improve the quality of water. This will cover aspects of water management to combat water shortage in the energy and mining sectors. Management of wastewater and produced water in the oil and gas sector, involving injection to the reservoir and suitable reclamation treatments will also be considered. Of particular importance for the mining sector, effective tailing management, will be discussed.

Key information

Year	2020/21
Credit value	15 (150 study hours)
Delivery	PGT L7, Campus-based
Reading List	View on UCL website
Tutor	Dr Sudeshna Basugupta
Term	Term 2
Timetable	View on UCL website

Assessment



■	Written examination (main exam period): 50.0%
■	Coursework: 30.0%
■	Group coursework: 20.0%

Find out more

For more information about the department, programmes, relevant open days and to browse other modules, visit ucl.ac.uk

Learning outcomes:

Upon successful completion of this module, the students will be able to:

- 1 Define the features of water as a natural resource
- 2 Optimize strategies for integrated water management
- 3 Understand the critical role of water management in the energy & resources sectors
- 4 Identify the primary methods and technologies currently used for water purification and reclamation related to mining and, oil and gas industries
- 5 Quantify the usage of water and assess impact(s) on quality in several operations related to energy and mining
- 6 Correlate and integrate groundwater flow with the overall hydrologic cycle
- 7 Quantify how the hydrologic cycle yields long-ranges economic and environmental effects
- 8 Know the principles of sustainable water management, including managing groundwater abstraction and aquifer recharge
- 9 Identify the stakeholders, and explain their interests as a function of water usage
- 10 Describe critically the operation of water markets and identify competing interests
- 11 Use software to predict risks associated with water usage in energy and resource operations