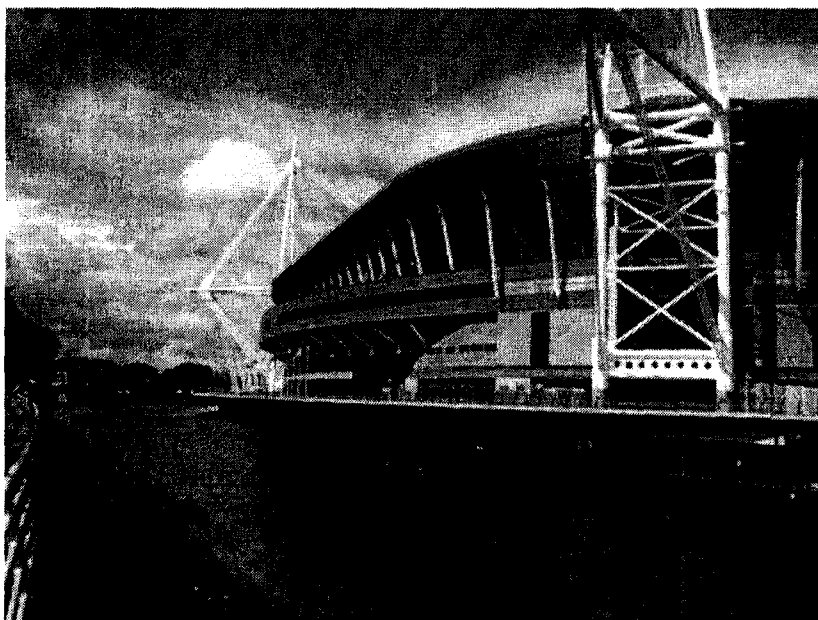


Introduction

Hydrogeological issues relating to water resources and the protection of groundwater are of increasing national and international importance. Global water resources are becoming depleted, scarcer and in greater demand, and climate change is creating new pressures on water management and supply. The demand for hydrogeological expertise is in consequence increasing as these issues are addressed. In addition, pollution arising from man's activities, both industrial and agricultural, poses serious threats to water resources and our environment. Remediation of the contaminated water and soil environments requires sound knowledge of hydrogeology. The MSc in Environmental Hydrogeology emphasises these environmental issues. Cardiff University is well placed to provide advanced training in Environmental Hydrogeology, both in respect to field sites in the adjacent Coalfield, the Cardiff Bay redevelopment area, and in the environmentally sensitive National Parks accessible from the city.

The Cardiff MSc in Environmental Hydrogeology provides students with advanced modules in Hydrogeology, together with modules shared with the MSc AEG course in geochemistry, risk-based assessment and remediation of contaminated land, pollution control and environmental protection. The course therefore provides a range of hydrological and hydrogeochemical skills suitable for a career with geo-environmental consultancies and regulatory authorities such as the Environment Agency and the British Geological Survey. All students are offered a summer industrial placement, many of which are paid, to undertake their project work. In consequence, graduates enjoy excellent employment prospects.



Water in the environment - think about hydrogeology!

Aims and objectives of the course

- To provide advanced study at the forefront of both academic and professional training in hydrogeology and appropriate to a career in environmental or engineering consultancy, geo-environmental protection and regulation, or with the water industry
- To introduce concepts of the hydrological cycle, water budgets and a larger environmental picture.
- To provide knowledge and understanding of the theory of water and contaminant movement through aquifer systems.
- To introduce students to the principles and practice of numerical modelling of groundwater flows and contaminant migration.
- To provide analytical and communication skills appropriate for professional practice.
- To develop skills in addressing complex issues systematically and according to professional codes of practice, including knowledge and understanding of specialist areas, as specified in the module description for this course.
- To teach field and laboratory research skills appropriate to hydrogeological investigation, analysis and interpretation.
- To provide students with industrial experience and thereby prepare them for work as professional hydrogeologists.

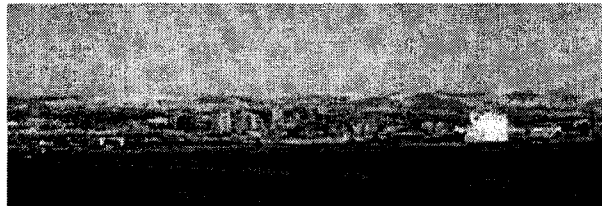
- To provide high-level skills in project planning and management.

Training

Training covers a wide range of specialist and transferable skills. The course is designed to integrate advanced Hydrogeological training with knowledge and understanding of the evaluation and remediation of contaminated land and groundwater, pollution control, environmental regulation and related site survey methods. Technical skills necessary to investigate a wide range of water-related geo-environmental topics are introduced. Taught modules include: water in the environment, hydrogeological and hydrological techniques, advanced groundwater modelling, applied geochemistry, contaminated land assessment and remediation, environmental law, Environmental Impact Assessment, transferable IT skills, project management, and safety training. Students undertake an industrial placement in the second part of the MSc programme, leading to the submission of a dissertation.

Employment Prospects

Graduates offer prospective employers a range of skills, allowing flexibility in employment outcome. The majority join engineering consultants, regulatory authorities such as the Environment Agency, and the water industry. There is an increasing demand for hydrogeological skills, both within the UK and internationally, providing excellent employment prospects for graduates of this course.



Cardiff Bay from Penarth.

Extensive groundwater control measures were intalled following impoundment

Cardiff Geo-Environmental Teaching and Research

Cardiff University Earth Sciences Department has a strong Geoenvironmental Research Group, wide teaching expertise and excellent industrial links. Research funded through NERC, the Royal Society, the EU

, Landfill Credit Tax, Local Government, and industry includes groundwater assessment, toxicity of contaminated water and leachates, geophysical monitoring and assessment of contaminated land and groundwater, landslide mechanisms and hazards, environmental monitoring (methane gas), landfill clay barrier performance, landfill leachate hydrogeology and geochemistry, contaminant migration studies, geo-conservation, hydrogeology and water resources. MSc students may undertake a

Cardiff Bay and the South Wales Valleys provide a wide range of hydrogeological case studies and site visits. The Department has excellent geochemistry, geotechnical and IT laboratories and the University provides additional analytical facilities through its strong Science and Engineering Schools.

Environmental study is an important part of our life

Course Outline

The MSc Environmental Hydrogeology course comprises a six-month taught course (Stage 1) followed by six months with an industrial partner undertaking project work for the dissertation (Stage 2). Stage 1 is assessed through examination and continual assessment, and all students must pass Stage 1 before moving on the Stage 2. A 20,000-word dissertation is submitted at the end of Stage 2. Details of Modules and project work are given below.

MSc Environmental Hydrogeology Modules

External lecturers denoted by Ext.

1. Water in the Environment

Module Code: EAT 013

Number of Credits: 20

Lecturers: Prof. Charles Harris, Dr. Yuesuo Yang

The module introduces the water cycle and balance, understanding of surface and groundwater flows and their interactions, aquifer hydraulic properties, collection and analysis of hydrological and hydrogeological data, and the use of such data in hydrogeological modelling.



Visit to Cardiff wastewater treatment plant

2. Hydrogeological and Hydrological Techniques (Exclusive to MSc EH)

Module Code: EAT011

Number of Credits: 20

Lecturers: external lecturers from industry

The module provides professional skills in planning and design of hydrogeological field investigations, hydrogeological field techniques for aquifer assessment and monitoring, and the analysis and reporting of hydrogeological data. Teaching includes a field project and external lecturers will provide a series of case studies.



Complex weir and stage recording facility, River Severn headstream, Plynlimon, Mid Wales

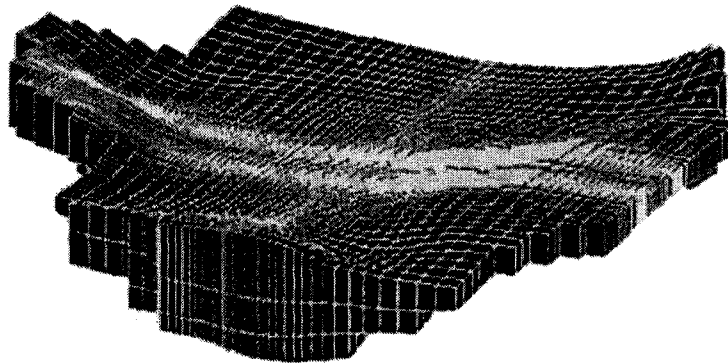
3. Advanced Groundwater Modelling (Exclusive to MSc EH)

Module Code: EAT010

Number of Credits: 20

Lecturer: Dr. Yuesuo Yang, Dr Chris Jackson (Ext.)

This module develops students' ability to characterise groundwater flow and solute transport based on the fundamental hydrogeological principals, to develop analytical solutions to hydrogeological problems. The course provides an understanding of the principles and applications of numerical modelling for groundwater flow and contaminant transport. Students are introduced to the conceptualisation, design and execution of numerical models of groundwater flow and contaminant transport using industry standard modelling software.



Aquifer conceptualisation for groundwater modelling

4. Land Contamination: Assessment, remediation and environmental protection

Module Code: EAT003

Number of Credits: 20

Lecturers: Dr Tim Jones, Nigel Brinn (Ext.), Nick Townsend (Ext.)

All aspects of contaminated land will be addressed in this module, including the chemical principles that underpin understanding and control of contaminants in the environment. Part 1 introduces the principles of environmental geochemistry together with field and laboratory methods. Part 2 of the module considers the assessment of contaminated land and the environmental effects of air pollution. Methods of investigation will be reviewed, including: health and safety, the nature of chemical contamination, testing, risk assessment and the legal framework. Part 3 deals with the reclamation and remediation of contaminated sites. The nature of contaminants in groundwater and soils, and risk-based strategies for land reclamation and containment of pollutants. Case studies will form important components of the course. In Part 4, the potential environmental effects of landfill waste disposal are addressed in the context of the legislative framework in place to control the licensing and operation of landfill sites.



Environmental quality and landfill is always a concern

5. Environmental Assessment and Regulation (Shared with MSc AEG)

Module Code: EAT004

Number of Credits: 10

Lecturers: Dr Lesley Cherns, Prof Charles Harris, Dr Rob Drayton (Ext.)

This module introduces a range of environmental issues against the background of the European and British Legislative framework. Three major topics are included:

- Environmental Law, including the various roles of regulatory bodies and the potential liabilities of land owners/users and their professional advisors is explained. The legal framework is outlined to demonstrate the ways in which public concern over environmental issues has driven legislation and raised the profile of contaminated land investigation and remediation.
- Environmental Law, including the various roles of regulatory bodies and the potential liabilities of land owners/users and their professional advisors is explained. The legal framework is outlined to demonstrate the ways in which public concern over environmental issues has driven legislation and raised the profile of contaminated land investigation and remediation.
- Geological Conservation, including the conservation of sensitive sites through designation as protected areas, the legal status of such areas and the regulatory framework underpinning them will be reviewed. Case studies based on geological conservation sites will be used to illustrate some of the issues raised.



Acid mine drainage, South Wales Coalfield



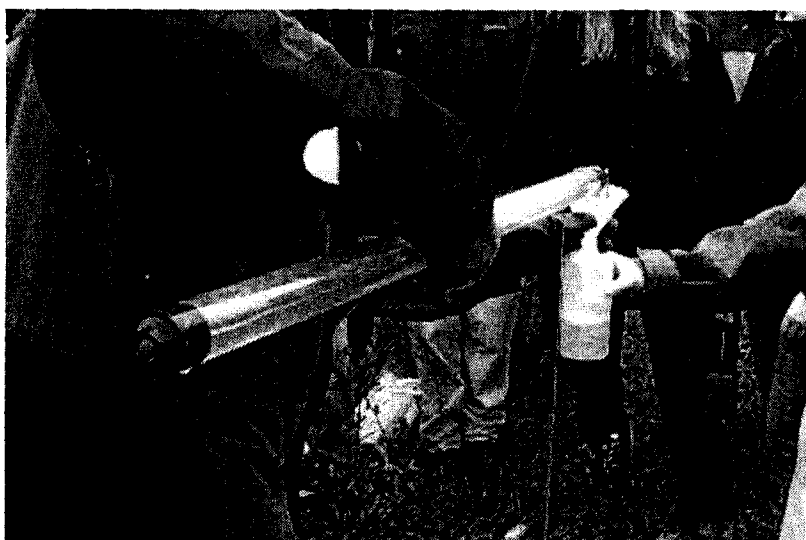
Groundwater sampling, Cardiff

6. Remote Sensing and Applied Geophysics

(Shared with MSc Environmental Hydrogeology)

Module Code: EAT005
Number of Credits: 10
Lecturers: Dr Peter Brabham and Prof Charles Harris

In this module students will be introduced to remote sensing techniques, the nature of satellite imagery, digital mapping and the interpretation of aerial photographs in applied geology, particularly in the context of engineering geomorphology. In addition to remote sensing from space platforms and aircraft, terrestrial geophysical techniques are widely applied in ground surveys for contamination-related and geotechnical investigations. Modern geophysical methods will be introduced and demonstrated, and case studies will be used to illustrate specific applications in environmental geology. In addition, advances in data analysis and modelling will be outlined. Spatial data management analysis based on GIS will form a component of computer-based training.



Sampling of landfill leachate for further analyses

7. Transferable Skills (shared with MSc AEG and PhD training course)

Module Code: EAT007
Number of Credits: 10
Lecturers: Dr Tim Jones, Dr Peter Brabham, Prof Charles Harris

This module will provide background training to support the learning process, make students aware of broad safety issues, provide research skills to support data collection and analysis; improve report writing and presentation and develop an improved awareness of business management and commercial practice. The first element will introduce research planning and design, data sources, project design and management, report writing and oral presentation. The second element will introduce the legal framework for Health and Safety and provide practical guidance on good practice in relation to Health and Safety issues. The third element of the module introduces students to the computing facilities at Cardiff University, then progresses to more advanced applications including GIS, data handling, statistical analysis and graphics packages.



Remediation of contaminated land and groundwater provides a prosperous environment

8. Project Planning, Design and Management

(Exclusive to MSc EH)

Module Code: EAT008

Number of Credits: 10

Lecturers: Dr. Yuesuo Yang and Industrial Contributors (Case Studies)

Case studies presented by industrial collaborators will integrate the theoretical content of other modules, and provide students with experience of engineering practice. Topics will include slope stability, investigation of contaminated land, environmental impact assessment, hydrogeological projects and pollution control. Lecture-room presentations will be supported by site visits where a range of engineering projects will be explained. The Project Training component of this module provides students with first-hand experience of project-work, including desk studies, field data collection, laboratory analysis and report writing. Two, two-week projects, will be organised in conjunction with staff from the British Geological Survey Hydrogeological Division. During the projects students will work in teams.



Groundwater sampling



Leachate monitoring

9. Dissertation

Module Code: EAT009

Number of Credits: 60

Dissertation work is undertaken in association with industrial collaborators, BGS, or regulatory authorities. Many industrial placements include remuneration from the host company. The dissertation, of maximum length 20,000 words, reports the outcomes of the student's project work. The dissertation must address a specific geo-environmental or geotechnical problem. Assessment includes an oral presentation summarising the main results of the project.

Infrastructural Support

Departmental analytical facilities include SEM, ICP-MS, XRF, XRD, AAS, CHNS GC, Ion chromatograph, Sedigraph, and a fully-equipped geotechnical soils laboratory. The department runs an Atlas Copco Vibrocorer for shallow percussion drilling. Field-based equipment also includes GA 1.1 Infrared Gas Analyser for use in MSc AEG projects. Departmental geophysical equipment includes a modern seismic reflection/refraction capability, and through linkage with Cardiff-based geophysics consultants Terradat (UK) Ltd, access to ground probing radar, Scintrex CG/3 micro-gravity meter, multi-electrode resistivity tomography, EM31 and magnetometer systems. The Department provides excellent IT facilities with computing laboratory and dedicated PCs with specialised software specifically for the MSc groups.

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