unine
Université de Neuchâtel
Faculté des sciences

MSc in Hydrogeology and Geothermics

Faculty of Science, University of Neuchâtel

Dedicated to water and underground energy ressources as solutions for a sustainable vision

Moving towards sustainable use of subsurface water and energy resources is a major challenge for our society, and for geoscientists in particular. This MSc degree, unique in Switzerland, offers a complete introduction to the current scientific approaches to address this challenge.

The program delivers comprehensive hydrogeological training that covers the relevant physical, chemical, biological and thermal processes, as well as key field investigation techniques.

Prof. in charge of the curriculum
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Version
Study plan dated 28 May 2025
Valid for the academic year 2025-2026

General structure of the program :

The Master in Hydrogeology and Geothermics is a 120 ECTS credits program planned over the span of 2 years. Intense teaching and practical field work over three semesters provide students with core knowledge and specific skills in hydrogeology and geothermics. The fourth semester is devoted to an individual research project, to be carried out internally or in collaboration with external partners.

Semester 1	Semester 2	Semester 3	Semesters 3 and 4
Fundamentals of Geothermics, Hydrogeology and Hydrochemistry	Hydrogeological Systems	Advanced Methods	Master thesis preparation and research
Fundamental Skills	Methods I	Methods II	
	Resources Management I	Resources Management II	
30 ECTS	**30 ECTS**	**24 ECTS**	**36 ECTS**

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First year (semesters 1 and 2)

Modules/courses	Duration	Semester	ECTS	Principal Lecturer(s)	Evaluation
Fundamentals of Geothermics, Hydrogeology and Hydrochemistry			**18**		
Hydrological and Hydrogeological processes	56	A	6	Prof. P. Brunner	Written, 2 hours
Hydrochemistry	28	A	3	Dr C. Wanner	Written, 1 hour
Geodynamics, Earthquake Physics and Geothermics	56	A	6	Prof. S. Miller	Written, 2 hours
Geothermal Field Trip	7 d	A	3	Prof. B. Valley	CA (pass)
Fundamental Skills			**12**		
Mathématiques et statistique	28	A	3	Prof. A. Matei	Written, 1 hour
Scientific Method and Communication	28	A	3	Dr L. Halloran	CA (graded)
Essais hydrauliques	28	A	3	Prof. P. Renard	CA (graded)
Field Camp I	7 d	A	3	Prof. C. Roques	CA (pass)
Hydrogeological Systems			**9**		
Systèmes karstiques	28	S	3	Dr P-Y. Jeannin	CA (graded)
Fractured Systems	28	S	3	Prof. B. Valley	CA (graded)
Systèmes aquifères alluviaux	28	S	3	Prof. C. Roques	CA (graded)
Methods I			**12**		
Natural and Artifical Tracers	28	S	3	Prof. D. Hunkeler	Written, 1 hour
Hydrogeophysics and Borehole Geophysics	28	S	3	Prof. B. Valley, Dr K. Holliger	CA (graded)
Hydrogeological Modelling	28	S	3	Prof. P. Brunner, Dr L. Halloran	CA (graded)
Numerical Modelling of Transport and Geomechanical Processes I	28	S	3	Dr Y. Epting	CA (graded)
Resources Managment I			**9**		
Water Supply and Protection	28	S	3	Profs. B. Valley, D. Hunkeler	CA (graded)
Contaminants Hydrogeology	28	S	3	Prof. D. Hunkeler	CA (graded)
Engineering Geology and Geotechnics	28	S	3	Prof. B. Valley	CA (graded)
Total ECTS First year courses			**60**		

Second year (semesters 3 and 4)

Modules/courses	Duration	Semester	ECTS	Principal Lecturer(s)	Evaluation
Methods II			**12**		
Stochastic Hydrogeology	28	A	3	Prof. P. Renard	CA (graded)
Numerical Modelling of Transport and Geomechanical Processes II	28	A	3	Dr Y. Epting	CA (graded)
Field Camp II	14 d	A	6	Dr L. Halloran	CA (pass)
Advanced methods (choose one)			**3**		
Remote Sensing	28	A	3	Dr S. Mhanna et Prof. P. Brunner	CA (graded)
Geological Modelling	28	A	3	Prof. C. Roques	CA (graded)
Resources management II			**9**		
Urban Hydrogeology	28	A	3	Prof. M. Schirmer	CA (graded)
Humanitarian Hydrogeology	28	A	3	Dr. E. Milnes, Prof. P. Brunner	CA (graded)
Systèmes géothermiques peu profonds	28	A	3	Dr V. Badoux	CA (graded)
Total ECTS Second year courses			**24**		
Master thesis preparation and research			**36**		
Seminar and project	90	A	6	Profs. P. Brunner, D. Hunkeler, B. Valley et P. Renard	CA (pass)
Master thesis		S	30		CA (graded)
Total ECTS MSc in Hydrogeology and Geothermics			**120**		

Complementary information

Evaluations and regulations

- Course and exam registration in IS-Academia is compulsory for course validation.
- For details regarding Faculty regulations, please consult the *Règlement d'études et d'examens de la Faculté des sciences* and existing directives on the Faculty's webpage (www.unine.ch/sciences).
- Continous assessment evaluations (pass or graded) are specified in the corresponding course description.

Abbreviations and grades

CA = continous assessment
d = days
N.N. = teacher to be designated
A = autumn semester
S = spring semester

Learning outcomes

Upon completion of the program, the student is capable of:

Knowledge and understanding:
- Know the basic principles of hydrogeology and geothermal energy.
- Describe the processes of flow, substance and contaminant transport, and heat exchange occurring in the subsurface.
- Identify and characterize the principal types of aquifers.
- Recognize the main issues related to hydrogeology and geothermal energy.

Application of knowledge and understanding
- Design a hydrogeological study based on bibliographical research, data analysis and field work.
- Implement standard investigation methods in hydrogeology and geothermal energy.
- Apply dimensioning approaches for underground structures in relation to hydrogeology and geothermal energy.
- Collect, process and analyze hydrogeological data sets
- Master numerical calculation tools adapted to the fields of hydrogeology and geothermics.
- Develop credible conceptual models of underground flow and transport processes from complex and incomplete data.

Ability to form judgments:
- Assess the quality of hydrogeological data collected in the field.
- Evaluate scientific or technical articles, research projects or reports in the fields ofhydrogeology and geothermal energy.
- Choose the most appropriate method from among several, considering the regulatory, formal, and economic contexts.

Communication skills:
- Write a scientific or technical report adapted to the target audience, in French or English, integrating your own measurements and putting them into perspective with prior knowledge.
- Present hydrogeological data in the form of maps, diagrams or other appropriate representations.
- Present results relating to hydrogeology and geothermal energy clearly and appropriately to the target audience, either orally or using other appropriate media.
- Communicate with experts in related fields.

Learning skills:
- Develop a project, from conceptualization to report, addressing a specific question in the field of hydrogeology and geothermal energy.
- Search, structure, and synthesize available information, and integrate it in relation to data that you acquired.