

Master's Degree (M.Sc.)
in
“Hydrology and Water Quality”

**The Albert Katz International School of Desert Studies, the J. Blaustein Institutes for Desert
Research
Sde Boker Campus**

*Joint teaching program of the A. Katz International School of Desert Studies in the Institutes for
Desert Research
in collaboration with
The Department of Geology and Environmental Science, the Department of Geography and
Environmental Development
and the Environmental Engineering Unit*

Goal of the curriculum:

- *Bestowing knowledge in subjects flow and transport processes of water, solutes, solids and separate phases in the soil, groundwater and in surface water.*
- *Strengthening and expanding foundations of: hydrology, hydrogeology, hydrochemistry, hydro-microbiology, underground flow in a saturated medium (aquifer) and an unsaturated medium, flow in channels and rivers and management of water resources, in accordance with chemical and physical principles.*
- *Training skilled professionals for the fields of hydrology (including: water production, estimating of surface and underground water and solute movement, chemical and biochemical evaluation of underground water and contaminants, operations research and optimization of water systems and more).*

Criteria for admission:

- *In accordance with the minimum requirements of each of the faculties and departments participating in the curriculum.*
- *Students without an appropriate background who are interested in enrolling the M.Sc. in hydrology curriculum will have an individual curriculum tailored for them in accordance by the teaching committee, with supplementary courses.*
- *For an M.Sc. in geography and geology within the hydrology study stream (hydrogeology) in accordance with the requirements and generally accepted standards of each of the faculties and departments taking part in the curriculum*

The proposed curriculum has two tracks:

- **M.Sc. with thesis:** *mandatory courses (15 credits) + optional courses (8 credits) + enrichment courses (4) + mandatory seminary (1 credit) + thesis – research dissertation (12 credits), total of 40 credits.*
- **M.Sc. track for a diploma (without thesis):** *mandatory courses (15 credits) + optional courses (16 credits) + enrichment courses (4) + mandatory seminary (1 credit) + final assignment (4), total of 40 credits.*

Curriculum in Hydrology and Water Quality

A. Mandatory Courses (17 credit points)

Department	Lecturer	Semester	Credits	Subject	Course Number
AKIS	Dr. Ofer Dahan	A	2	Introduction to Hydrogeology	001-2-5024
or					
The Department of Geography and Environmental Development (Geography)	Dr. Ofer Dahan	A	2	Introduction to Hydrogeology (in Hebrew)	206-2-3511
AKIS	Dr. Carmi Genadi	B	2	Surface-Water Hydrology	—
AKIS	Dr. Zeev Ronen	A	2	Microbiology of Water Reservoirs	001-2-5032
or					
Geological and Environmental Sciences (Geology)	Dr. Zeev Ronen	A	2	Microbiology of Water Reservoirs (in Hebrew)	206-2-4071
Geological and Environmental Sciences (Geology)	Prof. Y. Ganor	A	2	Geochemistry of Water (in Hebrew)	206-2-4191
AKIS	Prof. Eilon Adar	B	2	Water Resources and Water Systems in Israel and the Middle East	001-2-5025
Environmental Engineering	Prof. Asher Brener	A	3	Water Pollution Control (in Hebrew)	376 2-5011
AKIS	Dr. Alex Yakirevich	B	2	Migration Processes in the Flow Unsaturated Zone of Soil	001-2-5006
or					
Geological and Environmental Sciences (Geology)	Dr. Alex Yakirevich	B	2	Flow & Transport in the Unsaturated Zone (in Hebrew)	206-2-5261
or					
Geological and Environmental (Geology) Sciences	Dr. Noam Weisbrod	B	2.5	Introduction To Vadose Zone Hydrology	206-1-3771
AKIS	Dr. Ali Nejidat (coordinator)	B	0.5	Students Seminar (2 semesters)	001-2-9995/6
AKIS	Dr. Osnat	B,A	0	Departmental Seminar	001-2-

	Gilor (coordinator)			(EAM)	5555/6/7/8
or					
AKIS	Dr. Roni Kasher and Dr. Moshe Herzberg (coordinators)	B ,A	0	Departmental Seminar (WST)	001-2- 5550/1/2/3

EAM- Environmental and Aquatic Microbiology

WST- Water Sciences and Technology

All the above courses or equivalent (only if the equivalency is approved by the advisor and the head of the hydrology program) must be taken to complete the MSc in hydrology.

B. Optional Courses (Additional specific courses could be offered based of availability of the guest lecturer)

Department	Lecturer	Semester	Credits	Subject	Course Number
AKIS	Dr. A. Yakirevich	A	3	Introduction to Contaminant Hydrology	001-2-5015
or					
The Department of Geography and Environmental Development (Geography)	Dr. A. Yakirevich	A	2.5	Migration of Solutes & Contaminants in Groundwater (in Hebrew)	206-2-5081
AKIS	Prof. S. Sorek	A	3	Introduction to Modeling Transport Phenomena in Heterogeneous Media	001-2-5014
Environmental Engineering	Prof. S. Sorek	B	3	Flow and Transport Models for Porous Media (in Hebrew)	376-2-5023
AKIS	Prof. S. Sorek	B	3	Modeling Transport Phenomena in Porous Media	001-2-5007
or					
Environmental Engineering	Prof. S. Sorek	A	3	Modeling Transport Phenomena in Porous Media (in Hebrew)	376 376-2-5024
AKIS	Prof. Arnon Karnieli	A	2.5	Introduction to Remote Sensing and Geographic Information Systems to Assess Desertification	001-2-4004
AKIS	Dr. Osnat Gilor and Dr. Ines Soares	A	2	Introduction to Microbiology for non Biology Students	001-2-5020
AKIS	Dr. Ofer Dahan & Dr. Noam Weisbrod	B	3	Field Methods in Hydrology	001-2-5004

AKIS	Dr. Naftali Lazarovitch	B	2.5	Crop Irrigation Regimes	001-2-2035
AKIS	Dr. Naftali Lazarovitch	A	3	Soil Physics	001-2-2038
The Department of Geography and Environmental Development (Geography)	Prof. Yonatan Laron	A	3	Dynamic Geomorphology	128-2-0054
AKIS	Prof. Pedro Berliner	A	2	Hydro-Meteorology	001-2-5030
The Department of Geography and Environmental Development (Geography)	Prof. Pedro Berliner	B	2	Introduction to Micro-Climatology (in Hebrew)	128-2-5861
AKIS	Prof. Pedro Berliner	A	2	Hydro-Meteorology	001-2-5030
The Department of Geography and Environmental Development (Geography)	Prof. Pedro Berliner	B	2	Introduction to Micro-Climatology (in Hebrew)	128-2-5861
The Department of Geography and Environmental Development (Geography)	Prof. Pedro Berliner	A	2	Surface Water in Arid Zones (in Hebrew)	128-2-0094
The Department of Geography and Environmental Development (Geography)	Dr. Y. Alexandrov	A	2	Water & Environment	128-1-3211
Department	Lecturer	Semester	Credits	Subject	Course Number
Geological and Environmental Sciences (Geology)	Dr. Orit Sivan	A	3	Stable and Radioactive Isotopes in Water Systems (in Hebrew)	206-2-3951
AKIS	Prof. Eilon Adar	Concentrated course in the FALL break	3	Environmental Tracers (Isotopes and Hydrochemistry) in Arid Zone Hydrology (English)	001-2-5008
The Department of Geography and Environmental Development (Geography)	Prof. Dodi Avraham		2	Use of Environmental Tracers in Hydrology	128-2-6061
AKIS	Dr. Ronen, Dr. Gross & Dr. Gilor	Concentrated course in the Summer break	3	Laboratory Methods for Environmental Studies	001 001-2-5005
AKIS	Dr. Zeev Ronen	B	2	Bio-Degradation of Organic Compounds in Soil-Water.	001-2-5012
AKIS	Dr. N.oam Weisbrod	A	4	Rural Water Development	001-2-5029
Geological and Environmental Sciences (Geology)	Dr. Efrat Farber	B	2.25	Environmental Perspectives of Water Resources in Israel	206-2-5291
AKIS	Prof. Pedro Berliner		3	Runoff Agroforestry Systems	001-2-2004
AKIS	Prof. Yair Zarmi		3.5	Introduction to Stochastic Processes	001-2-4009
AKIS	Prof. Georgi Burde	A	3	Topics in Environmental Fluid Mechanics	001-2-4010

AKIS	Prof. Boris Zaltzman	A	3	Partial Differential Equations in Mathematical Physics	001-2-4013
AKIS	Prof. Arnon Karnieli	B	2.5	Remote Sensing of Desertification Processes	001-2-4014
AKIS	Prof. Daniel Feuerman	A	3	Heat Transfer	001-2-4025
AKIS	Dr. Yossi Ashkenazi	B	3	Introduction to Geophysical Fluid Dynamics	001-2-4027
AKIS	Prof. Amos Zemel	B+A	3 (each part)	Statistical Methods - Part A and B	001-2-7007/8
Structural Engineering	Prof. Nimrod Halamish	B	4	Theory of Fluids (in Hebrew)	374-1-3040
Environmental Engineering	Dr. Diago Berger	A	3	Engineering of Water Systems (in Hebrew)	376-2-5029
Environmental Engineering	Dr. Jack Gilron	A	3	Elements of Reactor Engineering (in Hebrew)	376-2-5031
The Department of Geography and Environmental Development (Geography)	Prof. Yonatan Laron		2	Stream Dynamics	128-2-5091
The Department of Geography and Environmental Development (Geography)	Prof. Arnon Karnieli		3	Remote Sensing of Environment Aspects (in Hebrew)	128-2-0074
Department	Lecturer	Semester	Credits	Subject	Course Number
Environmental Engineering	Prof. Oron		3	Management Analysis of Water Resources (in Hebrew)	376-2-5022
Life Sciences department	Dr. Amos Buskila		3	Matlab Solutions For Biological Problems	205-2-9611

C. Enrichment Courses (up to 4 credit point from that list)

Department	Lecturer	Semester	Credits	Subject	Course Number
AKIS	Dr. Dina Zilberg and Dr. Amit Gross	A (Concentrated Course)	2	Introduction to Aquaculture	001-2-2015
AKIS	Dr. Moshe Herzberg	A	2	Microbial Biofilms in Water and Wastewater Treatment Processes	001-2-5028
The Department of Geography and Environmental Development (Geography)	Prof. Dan Blumberg	A	3	Image Processing for Remote Sensing	128-2-0134

AKIS	Prof. Ali Najidat	B	2	Nitrogen Transformations and Environmental Quality	001-2-5026
AKIS	Prof. Alon Tal	B	2	Desertification and Public Policy in the Drylands	001-2-8031
Environmental Engineering	Prof. Yoram Oren	A	3	Environmental Chemistry (in Hebrew)	376-2-6031
AKIS	Prof. Yoram Oren	B	3	Environmental Oriented Electrochemistry	001-2-5034
AKIS	Dr. Drora Kaplan	A	2	Heavy Metals in Wastewater (English)	001-2-5002
AKIS	Dr. Ali Nejidat	A	2	Applications of Genetic Engineering in Environmental Microbiology	001-2-5013
AKIS	Dr. Osnat Gilor	B	2	Microbial Biodiversity	001-2-5019

Research Assignment

Students who opt for the research track (option A – thesis) must conduct an in-depth research assignment in one of the fields that they have studied. The thesis subject and research proposal will be approved as usual by the teaching committee of the study stream. Once the approval has been given by the teaching committee of the study stream, the project will be registered at the secretariat of joint program.

After the students successfully pass the core courses, they may focus on a specific research field in which they will expand their knowledge through optional courses and apply their knowledge in the research field before composing their thesis. This thesis will grant the student the basic skills and requirements needed for advanced research if he or she wants to continue to study for a Ph.D. degree.

The study will cover a certain aspect of hydrology, hydrogeology, hydrochemistry or microbial processes in water bodies in detail. The study will include a review of literature on the selected subject, clear wording of the problem being researched, a detailed case analysis of the findings and an evaluation of the results.

Final assignment

All students who opt for the track without a thesis (option B - project) must perform a limited scope research project in the format of an expanded seminary. The aim is to provide the student an opportunity to apply the knowledge that he acquired for solving a specific problem or for a limited study of one subject (or a combination of the two) in hydrology, hydrochemistry or microbial processes in water bodies, inter alia for increasing their knowledge on the chosen project subject. The program and optional subjects will be chosen in arrangement with and with the approval of the academic advisor and will be approved by the teaching committee for the hydrology M.Sc. program.

The project will provide deeper insight into the hydrological system. The project will include a review of literature on the selected subject, clear wording of the problem, analysis of the findings and an evaluation of the results.

Supplementary Courses for B.A. Holders

Example of selected supplementary courses for students without an appropriate background for the hydrology M.Sc. study stream

A) Minimum required level (students of all study streams)

Course no.	Name	Credits
201-19431	Mathematics of Systems 1	5
204-11531	General Chemistry B	3.5
204-11611	Introduction to Analytic Chemistry B	3
201-19441	Mathematics of Systems 2	3
203-11331	Physics 1 for Life Science and Geology	3.5
204-11621	Introduction to Physical Chemistry 1	3
201-19101	Introduction to Probability B	2
201-19411	Introduction to Statistics B	2.5
204-11543	General Chemistry Laboratory	2
203-11431	Physics 2 for Life Science and Geology	4.5

B) Additional courses that are mandatory for some of the curricula in the study stream.

Course no.	Name	Credits
	Hydrogeology	
	Geology of Israel	
204-11721	Introduction to Organic Chemistry	3.5
204-12611	Introduction to Physical Chemistry 2	2