The Albert Katz International School for Desert Studies

Master’s Degree Program in Desert Studies

Master’s Degree Program in Hydrology & Water Quality

Ph.D. Degree Program

The Albert Katz International School for Desert Studies

The Jacob Blaustein Institutes for Desert Research
Ben-Gurion University of the Negev’s Jacob Blaustein Institutes for Desert Research are acknowledged leaders in desert studies. In light of the worldwide need for expertise in the study of drylands, the University and the Institutes have established the Albert Katz International School for Desert Studies, which offers a two-year program leading to a Master’s degree in Desert Studies or in Hydrology and a Ph.D. Program.

The multi-disciplinary research areas have emerged in response to the lack of science-based responses to the urgent needs of humanity. Desert Studies, as a discipline is likely to grow into a distinct scientific activity in its own right.

The innovative, multidisciplinary program in Desert Studies is structured to provide an integrated approach, offering students exceptional opportunities to pursue a combination of basic and applied research. Students are exposed to a wide range of disciplines complementary to their major areas of specialization.
International School for Desert Studies

The Albert Katz International School for Desert Studies (AKIS) was established in 1999 as part of the Jacob Blaustein Institutes for Desert Research (BIDR).

The School offers a few graduate programs:
- A two-year Master’s program in Desert Studies
- A two-year Master’s program in Hydrology & Water Quality
- A four-year Ph. D. program.

The courses in all programs are taught in English by researchers from the BIDR and from other faculties at Ben-Gurion University of the Negev, and, occasionally, by leading scholars from the international community.

The innovative, multidisciplinary programs are structured to provide an integrated approach, offering students opportunities to pursue a combination of basic and applied research.

AKIS is located on the Sede Boqer Campus of Ben-Gurion University of the Negev. The campus is set within the arid Negev Highland region, some 50 km south of the city of Beer-Sheva. The School’s research and teaching facilities are all located on the Sede Boqer Campus. Some fieldwork is done in research stations situated in various parts of the Negev. Our modern students’ dormitories were designed according to the principles of climate and energy conscious architecture. We have accommodation for single as well as married students.

M.Sc. in Desert Studies

AKIS offers students who hold a B.Sc./ B.A. or equivalent degree from a recognized academic institution the possibility to pursue their graduate studies within the framework of one of the following two programs:

Master’s Degree in Desert Studies, specializing in:
- Ecology of Drylands
- Agriculture and Biotechnology of Drylands
- Solar Energy and Environmental Physics
- Environmental Studies
- Irrigation and Plant Environment

Master’s Degree in Hydrology and Water Quality, specializing in:
- Water Resources
- Desalination & Water Treatment
- Environmental Microbiology and Water Quality
The Albert Katz International School for Desert Studies

M.Sc. in Desert Studies specializing in
Ecology of Drylands

Deserts, far from being desolate wastelands, support an amazing variety of plants and animals, whose physiologies, morphologies, and behaviors are adapted to harsh conditions. Thus, deserts offer natural laboratories for studying natural selection in action. Moreover, deserts offer simple, transparent systems for studying the consequences of these selected traits for individuals, populations, and communities. Deserts often inspire new theories in ecology and provide the crucible in which we test them.

Research at the Mitrani Department of Desert Ecology MDDE spans the spectrum of biological organization, including the genetic, physiological, behavioral, population, community, and landscape ecology of desert plants and wildlife. A broad range of animals competing for limited resources are under study, among them, spiders, insects, birds, lizards, ungulates, rodents, bats, onagers, and other mammals. Cutting-edge research ranges from promoting the reintroduction of extirpated fauna and flora to the Negev Desert, to studying the physiological basis of ecological interactions, to viewing species interactions as foraging games. These advances in ecological understanding serve as tools for conserving biodiversity, developing better understanding and managing ecosystems of all types. A wide variety of research projects are available to graduate students for thesis work.

Physiological Ecology in Extreme Environments
- Physiological limits to flight duration in migrating birds
- Drought-responsive genes in populations from desert habitats
- Phenotypic plasticity of developmental hierarchies in plants

Plant – Animal Interactions
- Coevolution of plant-animal interactions and plant defenses
- Effects of herbivore activity on plant communities

Behavioral and Community Ecology
- Sexual selection in spiders
- State-dependent behavior and predator-prey foraging games
- Applying foraging theory to the study of biotic communities

More details can be found at:
www.bgu.ac.il/mdde
M.Sc. in Desert Studies specializing in Agriculture and Biotechnology of Drylands

Approximately 40% of the Earth’s terrestrial surface comprises drylands, which are home to more than two billion people. These arid areas, including such diverse ecosystems as deserts, savannahs and tropical dry forests, are often characterized by population growth, over-exploitation, drought and desertification that lead to declines in crop productivity. The sustainable production of food in regions where traditional or conventional methods of agriculture are difficult or impossible to implement can be ensured by developing agrotechnologies or biotechnologies. The present program provides students the tools to deal with these issues by carrying out cutting-edge research in extensive and intensive agriculture.

Research Topics:

Desert Plant Physiology, Ecophysiology, Biochemistry and Biotechnology
• Micropropagation and tissue culture
• Metabolic engineering for crop improvement
• Acclimation and adaptation to environmental stress
• Phytopharmaceuticals and secondary metabolites
• Genetics and epigenetics
• Ecophysiology

Microalgal Biotechnology
• Indoor and outdoor microalgal intensive and extensive growth
• Design of efficient photobioreactors
• Basic and stress algal physiology overproduction
• Analysis and extraction of valuable secondary carotenoids and fatty acids
• Basic algal molecular biology and biochemistry
• Microalgal taxonomy and contamination management

Agronomy and Agrometeorology
• Runoff agriculture and afforestation
• Irrigation and crop water use
• Agricultural systems modeling

Aquaculture and Aquatic Animal Health
• Diseases in recirculating aquaculture systems
• Diseases in ornamental fish
• Development of natural therapeutants and immunostimulants

Animal Production and Adaptation
• Livestock production in desert conditions
• Host–parasite relationships
• Biotic and abiotic effects on the behavioral and physiological responses of animals

Further details of related research activities can be found at: www.bgu.ac.il/faab
M.Sc. students are offered the opportunity to engage in cutting-edge research in a wide range of fields, including:

**Physics of the Environment**
- Climatology
- Geophysical fluid dynamics
- Non-linear waves in the environment
- Ecological pattern formation
- Dust dynamics and aeolian processes and forms
- Remote sensing of land cover and land use changes
- Non-linear dynamics in environmental physical chemistry
- Membrane electrochemistry and micro-fluidics in desalination and separation
- Bio-reactors modeling and algae growth
- Optimal management of natural resources
- Modeling the effects of noise and disorder on ecosystems’ non-linear dynamics

**Solar Energy**
- Photovoltaic (PV) device modeling and design
- Characterization and physics of solar cells
- PV systems and grid-matching
- Theory of organic PV
- Charge transport and generation in soft PV
- Nano-materials for PV devices
- Applied optics for solar concentrators
- Solar furnaces and synthesis of novel materials
- Flow batteries for solar energy storage

Further details of related research activities can be found at: [www.bgu.ac.il/seep](http://www.bgu.ac.il/seep)
The Albert Katz International School for Desert Studies

M.A./M.Sc. in Desert Studies specializing in Environmental Studies

The Master’s degree program in Environmental Studies provides a unique academic perspective on the human and built environment in arid regions. Combining expertise in desert architecture and urban planning and the social sciences (sociology, anthropology, economics and policy studies), faculty and students examine the contemporary challenges of sustainable development, situating local case studies within regional and global contexts.

Architectural Design in Desert Environments
- Bioclimatic design, thermal comfort and energy efficiency, passive heating and cooling, lighting and visual comfort, building envelope geometry and materials, design tools, evolution of desert building technologies
- Monitoring, Indoor Environment Quality (IEQ), Post-Occupancy Evaluation (POE), retrofit energy upgrade of existing building stock
- Embodied energy and Life-Cycle Assessment (LCA)

Urban Design in Desert Environments
- Urban microclimate, microclimate of open spaces, pedestrian thermal stress and thermal sensation, sustainable and environmentally conscious design in arid zones

Urban and Regional Planning
- Urban development patterns in deserts, urban land use, sparsely populated desert regions, planning and sustainability, sustainable population growth, inter-regional migration

Disaster Management in Drylands
- Proactive emergency planning and crisis management in drylands, people and drylands in history, time-series analysis and risk assessment

Pastoralism and Sedentarism
- Agnation in Mid-East societies, nomadic and static pastoralism, urbanization of Bedouin peoples, villages for shepherds, Bedouin markets

Gender and Feminism
- Gender in cross-cultural perspectives, feminist theories and research methodologies

Political Economy of the Rural Sector
- The political economy of agriculture, water politics, development projects in Less Developed Countries (LDCs)

Social Analysis of the Environment
- Actor/network theory, technological diffusion, green building legislation, standards, behavioral issues and barriers

Further details of related research activities can be found at: www.bgu.ac.il/seep
M.Sc. Program in Desert Studies specializing in Irrigation and Plant Environments

The specialization focuses on the vital questions facing irrigators: when and how much to irrigate? The program provides tools to deal with the aforementioned questions within the special conditions prevailing in arid and semi-arid environments (e.g., high evaporative demand, saline water, low nutrient content). The specialization combines courses that deal with the fundamentals of soils, plants, water and atmosphere systems. In addition, the students explore different irrigation systems and study the feedback processes of irrigation systems with the soil and the plants.

Potential research topics

- The influence of dripper discharge rate on the yield and quality of vegetables and fresh herbs irrigated with saline water
- The effect of irrigation water salinity on the yield and quality of pomegranate fruits and products
- Irrigation scheduling of date palm trees using heat dissipation sensors
- Deficit irrigation of olives and water stress management strategies
- Irrigation via compost-filled trenches, distinguishing between physical and chemical benefits
- Managing desalinated water for irrigation
- The effect of management strategies on root and salt distribution in the soils of olive orchards irrigated with saline irrigation water
- Calculating the costs and benefits of desalination for agriculture – a regional economic-agronomic-environmental case study
- The influence of intensive organic and conventional agriculture on groundwater quality
- The surface-active properties of soil-organic-matter
- The effect of treated-wastewater-derived solids and dissolved organic matter on the structure and surface properties of soils
- Water and solute transport in treated-wastewater-irrigated soils
- The impact of recycling biosolids as a soil amendment on soil structure and water availability for plants
- Water and energy budgets of row crops
- Separating evapotranspiration into soil evaporation and canopy transpiration
- Dew and water vapor adsorption in arid environments

Contact details: Naftali Lazarovitch
lazarovi@bgu.ac.il
M.Sc. in Hydrology and Water Quality

Drylands occupy more than one-third of the land surface of the Earth, including most of the Middle East and Israel. Dwindling water supplies and deteriorating water quality impede the sustainable development of drylands and the well-being of their growing population. The aim of this program is to introduce the students to cutting-edge research and graduate education in water sciences (hydrology, water treatment and water quality), aimed at improving human well-being in drylands through technologies and policies for the sustainable use of water resources.

M.Sc. in Hydrology and Water Quality specializing in
Environmental Hydrology & Microbiology

Potential research topics:
- Identification & quantification of the sources of groundwater recharge
- Calculation & quantification of subsurface flow and transport mechanisms
- Remediation of water and soils using biotechnology
- Transport of contaminants to and within groundwater reservoirs
- Biological, chemical and physical treatment of domestic, industrial and agricultural wastewater and sludge
- Decentralized/onsite wastewater treatment systems
- Optimization of water production and transfer systems
- Understanding of the ecology of flow systems in aquifers and underground water reservoirs
- Enhancement of groundwater collection
- Development of biological treatments for industrial and domestic effluents
- Upscaling of laboratory-scale treatment processes
- Management of regional and international transboundary groundwater reservoirs
M.Sc. in Hydrology and Water Quality specializing in

Desalination & Water Treatment

- Improvement & development of new membranes for reverse osmosis and nano-filtration in seawater desalination
- Improvement of membranes for various types of wastewater and urban effluents after tertiary treatment
- Development of novel ion-conducting membranes
- Pre-treatment of water for reverse osmosis
- Development of methods to eliminate organic substances from industrial effluents and polluted groundwater
- Study of mechanisms in low/high-pressure desalination systems associated with reverse osmosis and nano-filtration
- Improvement of materials used in reverse osmosis
- Development of management practices and methods to reduce concentrate volumes
- Development of new techniques for the reuse of urban effluents
- Improvement of electrodialysis processes for the desalination of brackish water and for use in industry

Further details of related research activities can be found at:
web2.bgu.ac.il/ziwr
Or contact us
Ben-Gurion University of the Negev
Sede Boqer Campus, Midreshet Ben-Gurion, Israel 84990
Tel: +972-8-6596733 | Fax: +972-8-6596985
E-mail: dschool@bgu.ac.il