

## *Environmental Protection and Sustainability*



*Ben-Gurion University of the Negev*

## Course Syllabus

### *Instructors*

- Leading Instructor: Yaron Ziv, Ph.D., Associate Professor of Ecology and Evolutionary Biology, Spatial Ecology Lab, Department of Life Sciences, Ben-Gurion University of the Negev, Israel
- Shirli Bar-David, Ph.D., Senior Lecturer of Ecology and Conservation, Conservation and Ecological Genetic Lab, Mitrani Department of Desert Ecology, Jacob Blaustein Institutes for Desert Research, Ben-Gurion University of the Negev, Israel
- David Katoshevski, Ph.D., Professor of Environmental Engineering, Faculty of Environmental Engineering, Ben-Gurion University of the Negev, Israel
- Amit Gross, Ph.D., Professor of Environmental Hydrochemistry, Department of Environmental Hydrology and Microbiology, Zuckerberg Institute for Water Research, Ben-Gurion University of the Negev, Israel
- Isaac A. Meir, Ph.D., Associate Professor of Architecture and Town Planning, Desert Architecture and Urban Planning, Bona Terra Department of Man in the Desert, Jacob Blaustein Institutes for Desert Research, Ben-Gurion University of the Negev, Israel
- Meidad Kissinger, Ph.D., Associate Professor of Geography and Sustainability Science, Sustainability and Environmental Policy Research Group, Department of Geography and Environmental Development, Ben-Gurion University of the Negev, Israel

## *Course Description*

In this multi-disciplinary course, we will discuss some major challenges of environmental protection, by addressing the biological, physical and human themes of conservation.

In the Biological theme, we focus on the importance of biodiversity and actions we can take to conserve populations and communities. We review the threats to biodiversity and extinction rates and describe efforts to reintroduce endangered species as an important component of conservation activities. We then explain the benefits that healthy ecosystems provide for human beings and show that increasing biodiversity conservation within agroecological landscapes can significantly contribute to our conservation efforts.

In the Physical theme, we focus on air and water as elements that are negatively affected by humans and, in turn, cause critical problems to our health and threaten our future daily lives. We describe the composition and dynamics of the airborne particles that impact the greenhouse effect and also harm our health. We discuss the role of water as an essential building block for life and focus on methods of water treatment and reuse, such as gray water, to improve our future use of water.

In the human theme, we focus on the built-up environment and the consequences of our life in un-friendly buildings. We show how the green-building concepts and solutions can save energy and materials, as well as improve our well-being and reduce health problems. We demonstrate how particular activities can reduce our carbon use and ecological footprint. We give an overview of the emerging field of sustainability, which strives to connect different disciplines and offers ways to reduce energy and material waste, improve our well-being, and minimize our negative environmental impact on the next generations.

- ❖ **The course is designed for a basic, undergraduate level. No prerequisites are required.**
- ❖ **Time commitment for the course should be considered as 2-3 hours per section (week).**

## *Course Contact*

Due to the high number of students enrolled, we will not be able to reply to individual messages directly. However, you can post questions or problems in the "Discussion" tab (Course's home website). We will make every effort to reply and provide you with the proper assistance as soon as we can.

## *Key Course Elements*

Each of the course's eight sections (see syllabus below) is composed of video presentations, assignments and a final quiz. Video presentations and assignments are inserted one after the other to enhance the interactive experience of the course.

**Video presentations** play a major role in the information acquired throughout the course.

Assignments mainly include readings, tasks and discussions.

**Readings** are mandatory and provide essential information to help you thoroughly understand the course material. Each reading is followed by a set of multiple-choice questions (5-10) to help you test your knowledge of the reading material (ungraded).

**Exercises** are optional. However, they are intended to let you engage actively in the more challenging aspects of the course, by gathering data, analyzing information and sharing it with students like you from all over the world.

**Discussions** are mandatory and offer a wonderful method to interact with people from different countries and regions that have different experiences. Through the sharing of dilemmas and opinions, many new ideas and perspectives can be raised and widely distributed. Encountering new thoughts and different views can both enrich your knowledge and broaden your point of view. Please interact constructively and respectfully: <https://www.youtube.com/watch?v=tVqWcrMPxfY>

Other assignments are optional and may include movies and additionally optional readings.

**The Final Quiz** on each section is mandatory. It is composed of 10 multiple-choice questions that cover the video presentations.

## *Grading*

To be eligible for a **Verified Certificate** you have to pass the Final Quiz for each of the eight sections with a grade higher than 80% (you have 3 attempts for each quiz).

## *Main Learning Objectives*

Students will be able to:

- ❖ Become familiar with different aspects of environmental disciplines and directions
- ❖ Understand the complexities of environmental issues and their interactive effects
- ❖ Identify key major points in different fields related to environmental protection
- ❖ Prioritize practices and procedures to enhance ecosystem health and stability
- ❖ Explain to others why we must protect nature in specific ways
- ❖ Practice and apply diverse methods of sustainability

## *Course Schedule and Deadlines*

All course materials will be available from its start, i.e., Sunday, March 8, 2020.

All coursework intended to earn credit towards a Verified Certificate must be completed by July 23, 2020. The course ends on July 30, 2020.

# Course Outline

## Week 1 (Section 1): Biodiversity and Ecological Determinants (Prof. Yaron Ziv)

*General Introduction to the Course* (video)

- 1.1 *The Importance of Biodiversity* (video)
- 1.A **Reading** - "What is 'diversity'?"
- 1.2 *Ecosystem Functionality and Stability* (video)
- 1.B **Reading** - "Biodiversity" + questions
- 1.3 *Species Richness and Its Scale* (video)
- 1.C **Exercise** - "Species richness near me"
- 1.4 *Three Determinants of Species Richness* (video)
- 1.D **Discussion** - "The dilemma of biodiversity research"
- 1.5 *Summary* (video)
- 1.E **Section 1 - Final Quiz**

## Week 2 (Section 2): Conservation Biology and Species Reintroduction (Dr. Shirli Bar-David)

*Introduction to Conservation Biology* (video)

- 2.1 *Biodiversity and Species Extinction* (video)
- 2.A **Exercise** - "IUCN Red List"
- 2.2 *Causes of Species Extinction and Species Conservation* (video)
- 2.B **Movie** - "TED talk on de-extinctions"
- 2.3 *Reintroduction (1)* (video)
- 2.C **Reading** - "The concept of re-wilding" + questions
- 2.4 *Reintroduction (2)* (video)
- 2.D **Discussion** - "The dilemma of reintroductions as a conservation approach"
- 2.5 *Summary* (video)
- 2.E **Section 2 - Final Quiz**

## Week 3 (Section 3): Open Lands and Agroecology (Prof. Yaron Ziv)

- 3.1 *Introduction to Open Lands and Agroecology* (video)
- 3.2 *Ecosystem Services* (video)
- 3.A **Reading** - "How have ecosystem services and their uses changed?" + questions
- 3.3 *Combining Biodiversity Conservation and Food Production - Agroecology* (video)
- 3.B **Discussion** - "Land sharing vs. Land Sparing"
- 3.4 *Land Sharing and Protecting Natural Habitats Within Agricultural Mosaic* (video)

- 3.C **Exercise** - "Analyzing agroecological landscape"
- 3.5 *Case Study: Biodiversity in the Agroecological Landscape of Southern Judea Lowlands, Israel* (video)
- 3.D **Movie** - "Biological control by barn owls"
- 3.6 *Summary* (video)
- 3.E **Section 3 - Final Quiz**

#### **Week 4 (Section 4): Air Quality and Pollution (Prof. David Katoshevski)**

*Introduction to Air Quality and Pollution* (video)

- 4.1 *Air Pollution* (video)
- 4.A **Reading** - "What is PM?" + questions
- 4.2 *Air Pollution Sources, Health-Related Problems and Particle Motion* (video)
- 4.3 *Dynamics of a Smoke Particle* (video)
- 4.B **Exercise** - "Particle motion"
- 4.4 *Dynamics of Particles and How We Can Manipulate It* (video)
- 4.5 *How Can We Reduce the Risk Associated with Smoke Particles?* (video)
- 4.C **Discussion** - "What should a factory do"?
- 4.D **Section 4 - Final Quiz**

#### **Week 5 (Section 5): Water Quality and Greywater Reuse (Prof. Amit Gross)**

*Introduction to Water Quality and Greywater* (video)

- 5.1 *Water, Scarcity and Quality* (video)
- 5.2 *Water Pollution* (video)
- 5.A **Exercise** - "Water quality"
- 5.3 *Microbial Contamination in Water and Its Implications* (video)
- 5.B **Reading** - "Alternative water sources" + questions
- 5.4 *Greywater Characteristics, Opportunities and Challenges* (video)
- 5.C **Discussion** - "Greywater reuse: Opportunity or burden"
- 5.5 *Greywater Reuse and Summary* (video)
- 5.D **Section 5 - Final Quiz**

#### **Week 6 (Section 6): Green Sustainable Building (Prof. Isaac A. Meir)**

*Introduction to Green Sustainable Building* (video)

- 6.1 *Why Are Buildings and Construction of Relevance to this Discussion?* (video)
- 6.A **Reading** - "Apology for architecture" + questions
- 6.2 *What Are Buildings Made of? (Part 1+Part 2)* (video)

- 6.B **Exercise** - "Identify different materials and their properties"
- 6.3 *The User in the Buildings (Part 1+Part 2)* (video)
- 6.C **Reading** - "Green building standards in MENA"
- 6.4 *The Building as Part of the City* (video)
- 6.D **Movie** - "Densification of the city"
- 6.E **Discussion** - "Choose and analyze two urban spots"
- 6.F **Section 6 - Final Quiz**

### **Week 7 (Section 7): Urban Sustainability (Dr. Meidad Kissinger)**

*Introduction to Sustainability* (video)

- 7.1 *The 21st Century Urban World* (video)
- 7.A **Exercise** - "Comparison of urbanization processes"
- 7.2 *The Urban Environmental Problem and Challenges* (video)
- 7.B **Reading** - "Cities and the environment" + questions
- 7.3 *The Urban Sustainability Potential* (video)
- 7.C **Reading** - "Approaches to urban sustainability"
- 7.4 *The City as an Ecosystem* (video)
- 7.5 *Cities as Part of Ecosystems* (video)
- 7.D **Discussion** - "The urban dilemma"
- 7.6 *Summary - Can Cities Pave the Way towards Global Sustainability?* (video)
- 7.E **Section 7 - Final Quiz**

### **Week 8 (Section 8): World Sustainability (Dr. Meidad Kissinger)**

- 8.1 *Changing Socio-Environmental Interactions* (video)
- 8.2 *The Demographic Factor* (video)
- 8.A **Reading** - "Human ecology - basic concepts for sustainable development" + questions
- 8.3 *The Environmental Implications of Poverty and Affluence* (video)
- 8.B **Exercise** - "Nations' 'Environmental Performances'"
- 8.4 *Another Shaping Factor - Technology* (video)
- 8.C **Discussion** - "Can technology solve the problems"?
- 8.5 *Other Shaping Factors* (video)
- 8.D **Reading** - "Coadaptation of human social systems and ecosystems"
- 8.6 *The Way Forward* (video)
- 8.E **Section 8 - Final Quiz**

## Instructor Bios



**Yaron Ziv**, Ph.D., completed his undergraduate studies in the Faculty of Life Sciences at Tel-Aviv University (1988) and earned his MSc in Ecology from Ben-Gurion University (BGU) of the Negev (1991), Israel. He received his PhD in Ecology and Evolutionary Biology from the University of Arizona (1998), USA. During his PhD studies and postdoctoral training at the University of New Mexico, USA, he specialized in community ecology, macroecology and conservation biology.

Dr. Ziv joined the faculty of BGU in 1988 and he is currently an Associate Professor in the Department of Life Sciences and the Chairperson of BGU's Green Campus Initiative.

Dr. Ziv's research deals with the effect of spatial organization of physical and biological entities on dynamics and diversity of ecological units, from genes, through individuals and populations, to communities and ecosystems. In addition to studying basic scientific questions, his lab is involved in various conservation endeavors, such as ecological restoration, agroecology, and applied biodiversity distribution.

Dr. Ziv also engages in environmental educational activities, by serving on national and international committees. He is currently a member of the managing committee of the Israel Society of Ecology and Environmental Sciences and a member of the managing committee of the Society for Protection of Nature in Israel. He serves also as a member of the Man and Biosphere Committee of the Israel National Commission for UNESCO and as a Israeli delegate to the European Platform for Biodiversity Research Strategy.

[http://in.bgu.ac.il/en/natural\\_science/LifeSciences/Pages/staff/Yaron\\_Ziv.aspx](http://in.bgu.ac.il/en/natural_science/LifeSciences/Pages/staff/Yaron_Ziv.aspx)



**Shirli Bar-David**, Ph.D., completed her undergraduate studies in the Faculty of Life Sciences (1992) and earned her MSc. in Genetics (1995) at the Hebrew University of Jerusalem, Israel. She obtained her PhD in Ecology (2003) from Tel-Aviv University, studying the reintroduction of the Persian fallow deer in Israel. During her postdoctoral training at UC Berkeley, she studied disease dynamics in natural and colonizing wildlife populations, and at the University of Haifa, she integrated ecological and genetic data to study space use patterns of the endangered fire salamander.

Since 2007, Dr. Bar-David has been a faculty member at the Mitrani Department of Desert Ecology, Jacob Blaustein Institutes for Desert Research, Ben-Gurion University of the Negev. She is currently a Senior Lecturer and the head of the Conservation and Ecological Genetic Lab.



Her research focuses on the field of spatial ecology and spatial genetics and their implications for conservation biology and wildlife management. Specific topics of interest include the spatial and genetic structure of populations, wildlife reintroductions as a conservation tool, factors affecting range expansion of populations, and movement patterns of individuals under different landscape scenarios.

<http://in.bgu.ac.il/en/Labs/caegl/Pages/default.aspx>



**David Katoshevski**, Ph.D., studied at the Technion- Israel Institute of Technology, where he earned a BSc and an MSc degree in Aerospace Engineering and a PhD in Applied Mathematics. He completed two postdoctoral projects, spending one year at RWTH-Aachen in Germany, where he dealt with Diesel spray combustion, and 2.5 years at CALTECH where he worked on Atmospheric Aerosols.

Since 1998, Dr. Katoshevski has been a member of the Environmental Engineering faculty at Ben-Gurion University of the Negev, Israel, where he is currently a Professor. He conducts research on various subjects, including dynamics of particles and droplets, atmospheric modelling, combustion, bio-fuels, air pollution control, aerosol inhalation/exhalation and recently also water treatment.

He currently serves as the Chairman of the Israeli Association for Combustion Research, and heads the program for Safety Engineering.

<http://in.bgu.ac.il/engn/enviro/Pages/staf.aspx>



**Amit Gross**, Ph.D., completed his undergraduate studies in the Faculty of Agriculture of the Hebrew University of Jerusalem, Israel, in 1993. He earned his MSc. (1996) and PhD (1999) from Auburn University, USA, studying nutrient cycles in earthen ponds. During his postdoctoral training in Australia and Ben-Gurion University of the Negev, Israel, he studied various environmental issues related to water treatment and reuse and was recruited in 2003 to join the faculty of BGU.

He is currently a Professor and the head of the Department of Environmental Hydrology and Microbiology, Zuckerberg Institute for Water Research, Jacob Blaustein Institutes for Desert Research, Ben-Gurion University of the Negev, Israel.

Dr. Gross' research areas include treatment and efficient use of marginal water, remediation techniques, and the environmental risks associated with contaminated water resources and sludge (i.e., agricultural effluents, wastewater, and contaminated groundwater).

<http://in.bgu.ac.il/en/bidr/ziwr/ehm/Pages/staff/gross.aspx>



**Isaac A. Meir**, Ph.D., studied at the Technion - Israel Institute of Technology, from which he received BSc and MSc degrees in Architecture and Town Planning. He earned a Ph.D. in archaeology from the Ben-Gurion University of the Negev, focusing on the building technologies used in Byzantine settlements in the desert. He joined the faculty of the Blaustein Institutes for Desert

Research, Ben-Gurion University of the Negev, in 1986. He is an Associate Professor and has served as the Chair of Desert Architecture & Urban Planning and of the Bona Terra Department of Man in the Desert (2005-2010). He lectures in Israel and abroad, e.g., at the Architectural Association School of Architecture, London (1992); Oxford Brookes University (2000-1); Aristotle University of Thessaloniki (2010-2011); Donau Universitaet, Krems (2012-3); and the International Hellenic University (2012-2017).

Dr. Meir participates in the design of environmentally conscious and experimental projects in the Israeli deserts and acts as consultant to and member of various institutions, NGOs, and professional organizations. His research interests include sustainable design in arid zones; energy conservation in buildings; post occupancy evaluation and indoor environment quality; the life cycle energy analysis; retrofit and upgrade of vernacular prototypes with low-tech materials and details; microclimate of open spaces; and proactive contingency planning.

In 2014, in recognition of his research, educational outreach activities, and involvement in promoting green sustainable architecture, an experts' panel named him among the 100 most prominent contributors to Israel's environmental policy (in the infrastructure and construction sector). Among other prizes and awards, he received the Israel Green Building Council Award for Leadership in Green Building (2016).

[http://in.bgu.ac.il/en/bidr/SIDEER/MID/Pages/staff/Sakis\\_Meir.aspx](http://in.bgu.ac.il/en/bidr/SIDEER/MID/Pages/staff/Sakis_Meir.aspx)



**Meidad Kissinger**, Ph.D., is a geographer and a sustainability scientist specializing in bio-physical accounting and sustainability policy and planning. He holds an MSc in Natural Resource Management from the University of Haifa, Israel and a PhD in Urban and Regional Planning from the School of Community and Regional Planning at the University of British Columbia, Canada.

Dr. Kissinger is an Associate Professor at the Department of Geography and Environmental development at the Ben-Gurion University of the Negev, where he leads the Sustainability and Environmental Policy research group and heads the Negev Center of Sustainability.

Dr. Kissinger's professional interests and academic background are interdisciplinary. His research explores a variety of linkages between human activities and the natural environment (dependence and impact). He uses and develops bio-physical (i.e., land,

energy, water, waste) and sustainability-accounting tools, and examines the policy implications of human–environment interactions at several spatial and cross spatial scales. His research in recent years covers a wide range of sustainability research themes, including urban sustainability, food systems sustainability, energy society nexus, and behavior and the environment.

<http://in.bgu.ac.il/humsos/geog/Pages/staff/meidad.aspx>