



מכון הערבה

Arava Institute

معهد وادي عربة

# Introduction to Earth Sciences

Dr Hanan Ginat

3 academic hours, 3 credits

## Course description

This course introduces various elements of Earth Sciences such as geology, geomorphology and climatology. The course will emphasize the connections between earth systems such as geosphere, hydrosphere, atmosphere and biosphere. This course examines these different elements within the framework of the “*Natural History of the Arava Valley*”.

## Course Requirements

The course includes two mandatory one-day field trips. The lessons are comprised of worksheets, exercises and other elements of active learning. All students are expected to complete the required readings and come to class prepared to discuss that week's readings. In addition to participating in class discussions and field trips, students will have either a midterm exam or a final exam, and one final project.

## Grading Components

Quiz	10%
Exam	50%
Final Project	30%
Participation	10%

## Course Readings

The main reading of this course is from the book:

Skinner B.J, Porter S, and Park J. *Dynamic Earth: An Introduction to Physical Geology*. 5<sup>th</sup> ed. USA: Wiley and Sons, 2004.

There will be other required and recommended readings from papers related to the Arava Valley, our local environment.

## Schedule and readings:

Lesson 1:

- Introduction to the course.
- The Rock Cycle Part 1 -presentation and exercises.
- Earth materials and main processes

Required Reading:

Skinner B.J, Porter S, and Park J. *Dynamic Earth: An Introduction to Physical Geology*. 5<sup>th</sup> ed. USA: Wiley and Sons, 2004.98-138.

Lesson 2

- The Rock Cycle -“Earth Materials and Processes” Part 2 with "KESEM KITS" and outdoor exercise.

מכון הערבה ללימודי הסביבה ע"ר Arava Institute for Environmental Studies

www.arava.org e-mail: info@arava.org

Kibbutz Ketura D.N. Eilat 88840 Israel

Tel. 972-8-6356618 Fax. 972-8-6356634



מכון הערבה

Arava Institute

معهد وادي عربة

Required Reading: Skinner B.J, Porter S, and Park J. *Dynamic Earth: An Introduction to Physical Geology*. 5<sup>th</sup> ed. USA: Wiley and Sons, 2004.172-201.

### Lesson 3

#### The Rock Cycle Part 3

- More experiments in Geology and using microscope for detailed observations
- Earthquakes and Geologic Time

Required Reading: Skinner B.J, Porter S, and Park J. *Dynamic Earth: An Introduction to Physical Geology*. 5<sup>th</sup> ed. USA: Wiley and Sons, 2004. 246-273, 276-300.

### Lesson 4

One day long field trip focused on geological main materials and processes and the main stages of the geology in the region in Canyon Shehoret and its surrounding area.

### Lesson 5

- Summary the field trip
- Introduction to Plate Tectonics, "The Restless Earth"

Required Reading: Skinner B.J, Porter S, and Park J. *Dynamic Earth: An Introduction to Physical Geology*. 5<sup>th</sup> ed. USA: Wiley and Sons, 2004.30-63.

### Lesson 6

- The Earth Systems – connections and relations between the Geosphere, Hydrosphere, Atmosphere and Biosphere.
- Geological History the Arava Valley

Required Reading:

Garfunkel, Z. (1988). The Pre-Quaternary Geology of Israel. In: Yom-Tov, Y. and Tchernov, E. (eds) *The Zoogeography of Israel*: 7-58.

Garfunkel Z., Zak I, Freund R. "Active faulting in the Dead Sea Rift". *Tectonophysics*, 1981.1-26.

Recommended Reading:

Barjous M. and Mikbel Sh. "Tectonic Evolution of the Gulf of Aqaba-Dead Sea Transform Fault System". *Tectonophysics*. 1990.180, 49-59.

### Lesson 7

- The Changing Face of the Land

Arava Institute for Environmental Studies ע"ר מכון הערבה ללימודי הסביבה

www.arava.org e-mail: info@arava.org

Kibbutz Ketura D.N. Eilat 88840 Israel

Tel. 972-8-6356618 Fax. 972-8-6356634



מכון הערבה

Arava Institute

معهد وادي عربة

- An Introduction to Desert Geomorphology
- Review and explanation of final project with list of subjects.

Recommended Reading:

Skinner B.J. Porter S, Park J. *Dynamic Earth – An Introduction to Physical Geology*. 5<sup>th</sup> Ed. 303-351.

Thomas D.S.G. “The Nature of Arid Environments” in *Arid Zone Geomorphology*, 1987. 2-7.

Lesson 8

- The Landscape Evolution of the Arava Valley
- Soils in the Arava Valley (Reg Soil, Hamada, Litho soils, Sand)

Required readings:

Cooke R, Warren A, Gouide A. *Desert Geomorphology*. University College London. 2-11; 18-56; 94-103.

Recommended reading:

Bein A, Yechieli Y, Bensabat J. “Quantifying the Groundwater Resources of the Southern Arava Rift Valley: A Confined Desert System Recharged Laterally by External Sources”. *Israel Journal of Earth Sciences*. v. 50:2-4; 217- 227.

Skinner B.J, Porter S, Park J. *Dynamic Earth – An Introduction to Physical Geology*. 5<sup>th</sup> Ed. USA: Wiley and Sons, 2004.160-167.

Amit R. and Gerson R. “The Evolution of Holocene Reg (Gravelly) Soils in Deserts - An Example from the Dead Sea Region.” *Catena* 13, 1986. 59-9.

Lesson 9:

- Exam (1.5 hours)
- The Geology of Timna Valley

Required Readings:

Avner U. “Ancient water management in the Southern Negev”. *ARAM*, 2002.13-14, 403-421.

Recommended Reading

Ginat H, Crouvi O, Beyth M. Landscape Evolution of Timna Valley. *Israel Journal of Earth Science*, September .2005.

**Lesson 10**

One day field trip focused on “Copper, Man and Environment” in Timna Valley

- 6000 years of mining.

מכון הערבה ללימודי הסביבה ע"ר Arava Institute for Environmental Studies

www.arava.org e-mail: info@arava.org

Kibbutz Ketura D.N. Eilat 88840 Israel

Tel. 972-8-6356618 Fax. 972-8-6356634



מכון הערבה

Arava Institute

معهد وادي عربة

- Renewed mining in Timna in the 21<sup>st</sup> Century – Geological and Environmental aspects.
- Timna Valley and Yotvata Salt Flat as samples of the very tight connection between the natural environment and biogenic and human activities.

#### Lesson 11

Geology and Physical aspects of the settlement in the Arava Valley

- Introduction to Climatology

Recommended Reading:

Skinner B.J, Porter S, Park J. *Dynamic Earth – An Introduction to Physical Geology*. 5<sup>th</sup> Ed. 447-473.

#### Lesson 12

- The Climate of the Arava Valley
- Main Characteristics of the regional extreme arid zone and the water regime of the regional desert; floods and groundwater in the Arava Valley.

Required Readings

McGinnis W.G, Goldman B, Paylore P. *Desert of the World*. The University of Arizona Publications, 1965.

Goldreich Y. and Karni O. "Climate and Precipitation Regime in the Arava Valley, Israel" *Israel Journal of Earth Sciences*, v.50: 2-4, 2001. 53-60.

Recommended reading:

Ben-Zvi A. and Shentsis I. "Assessment of Runoff as a Component of Water Resources in the Negev and Arava. *Israel Journal of Earth Sciences*. v. 50: 2-4, 2001. 61-70.

#### Lesson 13

- Student Presentations of Final Projects.
- Summary of the course