

# Introduction to Environmental Science

Environmental science is the study of patterns and processes in the natural world and their modification by human activity. The course aims to offer an opportunity for candidates that may not have prior knowledge of science, to study a range of environmental issues from a scientific perspective. The programme primarily seeks to provide scientific knowledge and understanding enabling the candidate to review environmental issues more objectively.

This course is designed to give an overview of environmental science, focusing on global as well as local environmental issues. The course will look at past, present, and future environmental issues and the chemical, physical and statistical tools that assist in the study of the environment. The course will cover the major environmental issues facing our planet: Air pollution / Population growth / Energy resources / The water cycle / Global warming / Hazardous substances / Ozone depletion

Each student will choose a specific topic to research and present to the class. The course will include one field trip.

*[Click here to download the syllabus](#)*



## Introduction to Environmental Science

Dr. Noah Morris

Dr. Tareq Abuhamed

3 weekly lecture hours, 3 credits. Undergraduate

### **Goals of the Course**

Environmental science is the study of patterns and processes in the natural world and their modification by human activity. This course is designed to give an overview of environmental science, focusing on global as well as local environmental issues. The course will look at past, present, and future environmental issues and the chemical, physical and statistical tools that assist in the study of the environment.

The course will cover the major environmental issues facing our planet:

- Population growth
- Air pollution,
- Global warming
- Energy resources
- The water cycle
- Hazardous substances
- Ozone depletion
- Biodiversity

Case studies will include examples from our area of the Middle East

### **Learning Objectives**

When you have finished this course, you will be able to

- Explain the basic chemistry, physics and biology behind environmental issues.
- Explain the interactions between humans and the environment.
- Acquire and apply scientific knowledge about environmental issues so as to understand the underlying scientific concepts,
- Describe how we can affect environmental issues in the future.

### **Course Description**

Each student will choose a specific topic to research and present it to the class:

Week 4 – Submit topic title.

Week 6 – Submit outline of presentation – meet with lecturer.

Week 8 – Submit first draft.

Weeks 12 and 13 – Presentation to the class and submit final paper.

The course will include one field trip.

Grade components:

Paper	30%
Final exam	30%
Quizzes	12%
Midterm	15%
Class participation	10%
Chemical of the week	3 %

**Textbook for the course:**

Chapters in: "Environmental Science" by Richard T. Wright, International Edition (9<sup>th</sup>)  
Pearson-Prentice Hall (2005)

**Class 1 - Introduction - Our planet – Towards a Sustainable Future**

***"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs". (The Brundtland Report 1987)***

Environmentalism and Environmental Science

Evidence based science

Definitions of sustainability

Natural and anthropogenic processes

How can sustainability be measured in terms of population, pollution, energy resources etc.?

Numbers tell stories

Discussion: Is sustainability achievable?

Is there a conflict between achieving sustainability and promoting human well being (poverty reduction)?

Dystopia v Optimism (where will the environment be in 2050?).

*Readings: "Environmental Science" by Richard T. Wright, International Edition (9<sup>th</sup>)*

*Pearson-Prentice Hall (2005), pages1-21and appendix C, pages 669-675.*

<https://www.gapminder.org>

**Class 2 Population and Development**

***"The battle to feed all of humanity is over. In the 1970s hundreds of millions of people will starve to death in spite of any crash programs embarked upon now. At this late date nothing can prevent a substantial increase in the world death rate..."(The Population Bomb by Paul Ehrlich - 1968)***

The world population from the year 1000 till 2100

What has caused the "population explosion"?

Exponential Growth

Rich Nations / Poor nations / Israel (a special case?)



Identifying, trend, seasonality and noise in meteorological data,  
Data analysis concerning global warming. What is the question to be answered?  
What stories do the numbers tell?

Discussion – How should we prepare for global warming?  
– Prediction - what will happen to the climate by 2045? How  
certain/uncertain are we?

David Appel (2015). Behind the Hockey Stick, *Scientific American*, 292(3): 34-35.

Readings: “Environmental Science” by Richard T. Wright, International Edition (9<sup>th</sup>)  
Pearson-Prentice Hall (2005), pages 538-570,

## **Class 5                      Atmospheric Pollution**

Acid rain phenomenon

Chemical reactions in the atmosphere and the environmental impacts of fossil  
fuels.

Primary and secondary pollutants

Particulate and gaseous pollutants

The hole in the ozone layer (chlorofluorocarbons) - a success story

Discussion – How can we affect policy on air pollution?

D. Fowler, N. Dise and L. Sheppard. Committee on air pollution effects research:  
*40 years of UK air pollution. Environmental Pollution. 208, 2016, Pages 876–878*

## **Class 6                      Mid Term Exam** **Submit outline of final paper – meet with lecturer**

A short lecture on making rational decisions in situations of uncertainty

## **Class 7                      Energy**

Forms of energy – heat, kinetic, potential

Conservation of energy

Transfer of energy - efficiency

The world's energy use and resources

Fossil fuels – past present and future

Entropy – a simple introduction

Discussion – responsible use of fossil fuel? Individual behaviour or Government  
policy?

Readings: "Environmental Science" by Richard T. Wright, International Edition (9th)

Pearson-Prentice Hall (2005), pages 323-347

L. White (2015). Energy production: *Is short-termism damaging our planet?*

Renewable Energy Focus. Volume 15, issues 5-6, Pages 120-123

### **Class 8                      Field Trip**

Some or all of the following places:

Recycling centre - Eilat

Sewage plant - Eilat

Land fill - Nimra

Meteorological Station - Yotvata

### **Class 9                      Alternative Energy**

Wind, Solar, Wave, Hydro electric, Biofuel

Energy storage

The Paris protocol

Data on the use of alternative energy

The case of nuclear energy

A case study - solar energy in Israel.

### **Class 10                  The Water Cycle and Water Pollution**

***"We forget that the water cycle and the life cycle are one".***

***(Jacques Yves Cousteau)***

The water cycle, properties of water, types of solutions;

The pH concept.

Waste water treatment

Chemical pollutants.

Data on the use of recycled water

How much water do humans use (by type of use, by region)?

A case study - aquifers in the Southern Arava

A case study - how use of data affected policy - Flint USA.

When to use of p-values and significance tests.

Readings: "Environmental Science" by Richard T. Wright, International Edition (9th)

Pearson-Prentice Hall (2005), pages 177-205, 462-489.

O. Kfir, A. Tal, A. Gross, E. Adar. The effect of reservoir operational features on recycled wastewater quality. *Resources, Conservation and Recycling, Volume 68, 2012, Pages 76-87.*

Hanna-Attisha M (2018). *What the Eyes Don't See: A Story of Crisis, Resistance and Hope in an American City*. One World publishers

## **Class 11 Solid Waste and Recycling**

Solid waste, hazardous waste, other types of wastes

Plastic waste in the oceans

Recycling – How, where and when?

Incineration

Landfill

Data on waste disposal on a world wide scale

A case study - the Southern Arava.

Discussion    How effective is recycling?  
                  What can be done about plastics in the oceans?  
                  Pros and cons of land fill?

*Readings: "Environmental Science" by Richard T. Wright, International Edition (9<sup>th</sup>)*

Pearson-Prentice Hall (2005), pages 490 – 511.

S.M. Al-Salem, P. Lettieri, J. Baeyens (2009). *Recycling and recovery routes of plastic solid waste (PSW): A review*. *Waste Management, Volume 29, Pages 2625-2643.*

H. Chan (2010). Removal and recycling of pollutants from Hong Kong restaurant wastewaters. *Bioresource Technology, Volume 101, Issue 17, Pages 6859-6867*

## **Class 12 Biodiversity and Agricultural Production**

Definition of biodiversity

Measuring biodiversity

Diversity and sustainability

How many species are there?

Food production and land use?

Intensive agriculture and sustainable agriculture

Discussion:    Are we observing a third mass extinction?  
                  Genetically modified (GM) food? For and against?

## **Class 13 Presentation of student's projects and review**

