

# Virginia Western Community College

## ENV 162

### Environmental Principles in Public Health

#### Prerequisites

BIO 101 strongly recommended.

#### Course Description

Examines critical factors involved in environmental/public health administration in the current post-911 society. Includes basic risk analysis and fate and transport modeling, environmental microbiology and toxicology with implications on genetics, GIS, bioterrorism, and infectious diseases.

**Semester Credits: 3**

**Lecture Hours: 3**

#### Required Materials

##### **Textbooks:**

Principles of Toxicology. Stine. 3rd edition. CRC Press. ISBN: 9781466503427

#### Course Outcomes

**At the completion of this course, the student should be able to:**

- Obtain a basic background in Environmental Toxicology, specifically how various man-made and naturally occurring chemicals in the environment can impact human health and the environment in which we live.
- Understand the principles of chemical absorption, distribution, metabolism and excretion (ADME) in humans and animals, and to describe the fate and transport of chemicals in the environment.
- Gain an understanding of the roles that chemicals play in our lives, and be able to make educated judgments regarding exposure to consumer products that may contain potentially harmful chemicals.
- Read a product information label found on consumer goods, including foods, pesticides, and household products and be able to identify potentially toxic product ingredients.
- Read and analyze scientific peer-reviewed journal articles and understand the content. Also, to develop a knowledge of the scientific method and to be able to distinguish “good” science from “poor” science.
- Assimilate scientific information and write a review article on a topic related to this course.

## **Topical Description**

### **Topic 1-Introduction to Environmental Toxicology-The Nature, Scope, and Impact of Chemicals in the Environment**

1. What is the science of toxicology?
2. Differences between biochemical and environmental toxicology
3. Types of chemicals in the environment
4. Dose and dose-response
5. Lethal dose vs. therapeutic dose
6. Regulation of chemicals and drugs

### **Topic 2-Principles of Toxicology I -Routes of Exposure and Elimination of Toxicants (ADME)**

1. Routes of exposure of toxicants
  - a. Respiratory
  - b. Oral/digestive
  - c. Dermal
2. Routes of elimination of toxicants
  - a. Lungs
  - b. Digestive
  - c. Skin
3. Distribution of toxicants
4. Metabolism of toxicants
  - a. Phase I metabolism
  - b. Phase II metabolism
  - c. Other metabolic processes

### **Topic 3- Principles of Toxicology II-Target Organs of Toxicants in the Human**

1. Lungs
2. Liver
3. Kidney
4. Central and peripheral nervous systems
5. Blood
6. Reproductive/endocrine

### **Topic 4-Environmental Toxicology I-Commonly Occurring Organic and Inorganic Toxicants**

1. Polychlorinated biphenyls (PCBs)
2. Polychlorinated diphenyl ethers (PCDEs)
3. Dioxin
4. Triclosan
5. Phthalates
6. Polybrominated compounds and fire retardants
7. Bisphenol A (BPA)
8. Heavy Metals
9. Other persistent organic pollutants

**Topic 5-Environmental ToxicologyII-Food Additives**

1. Types of food additives
  - a. Dyes
  - b. Preservatives
  - c. Processing aids
  - d. Nutrients
2. Potential toxicity of food additives
3. Regulation of food additives

**Topic 6-Environmental Toxicology III-Air Pollutants (Raven Chapt. 20)**

1. History of air pollution
2. Types of air pollutants
  - a. VOCs
  - b. Inorganic air pollutants
3. Sources of air pollutants
4. Primary vs. secondary air pollutants
5. Regulation of air pollutants
6. Indoor air pollution

**Topic 7-Environmental Toxicology III-Water and Soil Pollution (Raven Chapt. 22)**

1. Discussion of typical water and soil pollutants
2. Movement of water and soil pollutants in the environment
3. Health effects of soil and water pollutants
4. Remediation of soil and water pollutants

**Topic 8- Pesticide Toxicology I-Toxicology of Pesticides and Herbicides (Raven Chapt. 23)**

1. Brief history of pesticide usage
2. Classes of common insecticides
  - a. Organochlorine compounds
  - b. Organophosphate compounds
  - c. Pyrethroid compounds
  - d. New generation insecticides
3. Commonly used herbicides
  - a. Paraquat/diquat
  - b. 2,4-D
- c. Alachlor/metolachlor

**Topic 9-Pesticide Toxicology II-Sampling Techniques for Pesticides and Herbicides**

1. Gas chromatography (GC)
2. High performance liquid chromatography (HPLC)
3. Mass spectrometry (MS)
4. Biomonitoring

**Topic 10-Legislation and Regulation of Toxicants**

1. Federal Insecticide, Fungicide, and Rodenticide act (FIFRA)
2. Clean Air and Clean Water Acts
3. Federal Food, Drug and Cosmetic Act
4. Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)
5. Consumer Products Safety Act (CPSA)
6. Occupational Safety and Health Act
7. Resource Conservation and Recovery Act
8. Toxic Substances Control Act

**Topic 11-Risk Analysis-An Overview of the Risk Assessment Process**

1. Hazard vs. Risk
2. Steps of a risk assessment
  - a. Hazard identification
  - b. Dose—response assessment
  - c. Exposure assessment
  - d. Risk characterization
3. Risk assessment of endocrine disrupting chemicals

**Topic 12-Natural Toxins-Animal Venoms**

1. Mammal toxins
2. Fish toxins
3. Arachnid toxins
4. Amphibian toxins

**Topic 13-Natural Toxins-Toxic Effects of Plants**

1. Castor Bean Plant: *Ricinus communis*
2. Western Water Hemlock: *Cicuta douglasii*
3. White snakeroot: *Eupatorium rugosum*
4. Monkshood: *Aconitum napellus*
5. Common Bladderwort: *Utricularia macrorhiza*
6. Angel Trumpet: *Brugmansia*
7. Oleander: *Nerium oleander*
8. Mala Mujer: *Cnidocolus angustidens*
9. Deadly nightshade: *Atropa belladonna*

**Topic 14-Potential Chemical and Biological Agents of Terrorism**

1. Use of chemicals in warfare
2. Chemical terrorism-Sarin and ricin
3. Bioterrorism-Viruses and bacteria

**Notes to Instructors**

None.