# NATIONAL UNIVERSITY OF ENGINEERING
# COLLEGE OF ENVIRONMENTAL ENGINEERING
# ENVIRONMENTAL ENGINEERING PROGRAM

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# BO142 – ECOTOXICOLOGY

## I. GENERAL INFORMATION

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| **CODE** | **:** | BO142 – Ecotoxicology |
| **SEMESTER** | **:** | |
| **CREDITS** | **:** | 04 |
| **HOURS PER WEEK** | **:** | 04 (Theory – Practices) |
| **PREREQUISITES** | **:** | None |
| **CONDITION** | **:** | Elective |

## II. COURSE DESCRIPTION

The course of Ecotoxicology aims to study environmental pollutants, from their generation in the anthropogenic processes including their release, transport, distribution, transformation and entry into living beings, as well as the study of their effects and the tools that help us to size the risk to the ecosystem and to man by the presence of these in the environmental compartments. Its usefulness for the future professional is that it constitutes a scientific tool for the assessment of ecological and environmental risk by action of chemical contaminants in an event. The structure of this course will take future professionals to the knowledge and application of this tool in cases of contamination, through the analysis of the results of related scientific research.

## III. COURSE OUTCOMES

At the end of the course the student will:

- Organize the knowledge on environmental pollution according to the ecotoxicological process of the pollutants.
- Use bioassays as a methodology to assess environmental damage.
- Apply the risk assessment methodology to determine the impact of pollutants.
- Recognize how to use biomarkers, bioindicators and biomonitors as diagnostic tools for the prediction and control of pollution.
- Recognize the usefulness of the elements of ecotoxicology in national and international legislation.

## IV. LEARNING UNITS

### 1. ECOTOXICOLOGY - INTRODUCTION

Introduction / Definition / Ecotoxicology and toxicology / Historical perspective / Field of action.

2. **MAIN TYPES OF CONTAMINANTS AND THEIR DESTINATION IN ECOSYSTEMS**
Environmental / Toxic Compounds / Definition / Classification (main pollutants: organic, inorganic, nanoparticles) / General characteristics.

3. **ECOSYSTEMS**
Definition / Elements / Stability / Toxic processes in ecosystems. / Cycles of environmental pollutants.

4. **DESTINATION AND TRANSPORT OF ENVIRONMENTAL POLLUTANTS**
Phase of exposure to environmental pollutants / Entry of pollutants to ecosystems / Movement and transport of pollutants.

5. **DISTRIBUTION OF CONTAMINANTS (ECOTOXY CHINESE PHASE)**
Uptake / Biotransformation and detoxification / Elimination / Accumulation / Factors that influence bioaccumulation / Bioaccumulation by feeding and trophic transfer.

6. **BIOLOGICAL RESPONSES TO ENVIRONMENTAL POLLUTANTS (ECOTOXICODYNAMIC PHASE)**
(Ecotoxicodynamic phase). Biological responses to toxic substances in organisms and populations.

7. **EVALUATION OF EFFECTS**
Definitions. Concentration - effect and concentration - response ratio / Types of effects / Effects due to the toxic mixture / Genotoxicity, carcinogenicity / mutagenicity.

8. **ECOTOXICOLOGICAL ESSAYS**
Objectives / Models of ecotoxicological tests: Types of trials / Acute, sub-acute and chronic toxicity / Toxicity indices

9. **BIOMARCADAOES, BIOINDICADORES AND BIOMONITORES**
Importance and use.

10. **APPLICATIONS OF ECOTOXICOLOGY**
Applications in environmental legislation / Analysis of international cases.

11. **EVALUATION OF TOXICOLOGICAL RISK AND EXTRAPOLATIONS TO HUMAN POPULATIONS**
Risk assessment methodologies.

## V. LABORATORIES AND PRACTICAL EXPERIENCES

- Laboratory 1 (optional): Acute toxicity test with lettuce seeds (Lactuca sativa L).

## VI. METHODOLOGY

Classes are developed through professor expositions, based on the evaluation of pollution events in real life. In the classes will be carried out workshops of analysis and discussion of research works related to the field of study. Likewise, the students will develop throughout the course a research work based on the progress of each class, in such a way that they incorporate the elements learned.

The materials to be used are scientific documents, such as thesis, scientific articles, academic texts, as well as a sample, a test organism and materials to carry out bioassays.

## VII. EVALUATION FORMULA

The learning will be evaluated through the "G" system.

- Partial Exam: Weight 1
- Final Exam: Weight 2
- Qualified Practices: Weight 1.

Calculation of the Final Average:

$$FA = \frac{PE + 2 * FE + PA}{4}$$

PE: Partial Exam; FE: Final Exam, PA: Practices Average

For the Practices Average the three practices with the highest grades:

$$PA = \frac{QP1 + QP2 + Q3}{3}$$

## VIII. BIBLIOGRAPHY


- NEWMAN, Michael C. (2014). Fundamentals of Ecotoxicology: The Science of Pollution.
- DOMÉNECH, Xavier. (2014). Fundamentos de Química Ambiental II.
- WALKER CH. (2012). Principles of Ecotoxicology.
- MWINYIHIJA M. (2010). Ecotoxicological Diagnosis in the Tanning Industry. 2010