



**NATIONAL UNIVERSITY OF ENGINEERING**  
**COLLEGE OF ENVIRONMENTAL ENGINEERING**  
**ENVIRONMENTAL ENGINEERING PROGRAM**

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**QU115 – BIOCHEMICAL KINETICS**

**I. GENERAL INFORMATION**

<b>CODE</b>	: QU115 – Biochemical Kinetics
<b>SEMESTER</b>	: 8
<b>CREDITS</b>	: 04
<b>HOURS PER WEEK</b>	: 05 (Theory – Laboratory)
<b>PREREQUISITES</b>	: AA233 – Physical – Chemistry
<b>CONDITION</b>	: Mandatory

**II. COURSE DESCRIPTION**

The course introduces the student to the development of biochemistry from an evolutionary perspective and its application in the health sciences, industry, energy production and environmental protection techniques. In addition, the course introduces the study of enzymes and enzymatic kinetics as a key aspect of its operation. Finally, the aim is for the student to begin research on enzymes applied to waste treatment and bioremediation.

**III. COURSE OUTCOMES**

At the end of the course the student will:

- Know the functioning of enzymes as part of the metabolism of living beings.
- Evaluate, interpret and order information and data from enzymatic biochemistry making use of scientific literature.
- Explain the mechanisms and kinetics of enzymatic reactions and their regulation.
- Manage accessible information through the Internet and specialized libraries.
- Be able to give a short talk to a non-specialized audience about a topic of biochemistry and enzymatic activity with possible impact on society.

**IV. LEARNING UNITS**

**1. INTRODUCTION TO BIOCHEMISTRY AND BIOCHEMICAL KINETICS**

What is biochemistry? / Biomolecules / Energy and metabolism / Origin and evolution of life.

**2. BIOGEOCHEMICAL CYCLES**

What are the biogeochemical cycles? / Minerals connections: the roles of inorganic elements in living processes / The "things in life": identifying the biosphere material sets whose microbiological transformations drive biogeochemical cycles / Biogeochemical cycles and mass balance of cycles elementary

### 3. ENZYMES AND ENZYMATIC KINETICS

How do enzymes work? / Introduction to enzymatic kinetics / Enzymes inhibition / Effects of pH and temperature on the enzymes activity / Enzymatic activity regulation / Multienzyme systems.

### 4. BIOCHEMISTRY OF METABOLITES AND CHRONIC METABOLIC REACTIONS

### 5. ENZYMES ACTIVITY IN THE METABOLISM OF CONTAMINANTS

### 6. BIORREMIEDIATION

Relation between bioremediation technology and the physiological processes of biodegradation and biotransformation / Bioremediation Techniques.

## V. LABORATORIES AND PRACTICAL EXPERIENCES

- Laboratory 1: Sugars and lipids
- Laboratory 2: Enzymes are proteins
- Laboratory 3: Spectrophotometry and spectrophotometer management
- Laboratory 4: Measurement of enzymatic activity by spectrophotometry
- Laboratory 5: Enzymatic application to wastewater treatment.

## VI. METHODOLOGY

The course is developed in theory and practice sessions. In theory sessions, the teacher presents the knowledge of biochemistry and enzymatic kinetics as something to build and not as something given, where it is not enough with just repeating and illustrating a certain topic. The practical sessions, seek that the student acquires the skill and loses the "fear" when doing any task, being able to select instruments and appropriate elementary techniques to search, order and interpret correctly the information about the enzymes. At the beginning of the course, the student must choose a topic of interest, which should be developed as a Monograph (Mo) and presented at the end of the course. In all the sessions, the active participation of the student is promoted.

## VII. EVALUATION FORMULA

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

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

Calculation of the Final Average:

$$FA = \frac{PE + FE + PA}{3}$$

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

For the Practices Average the three practices with the highest grades, it must include the monograph:

$$PA = \frac{QP1 + QP2 + Q3 + Mo}{4}$$

## VIII. BIBLIOGRAPHY

- PLOU, Francisco. Las enzimas. CSIC, 2016.
- PRAT, C.W. y CORNELLY, K. Bioquímica. Editorial Manual Moderno, 2012.