NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF ENVIRONMENTAL ENGINEERING
SANITARY ENGINEERING PROGRAM

SA115 – ENVIRONMENTAL SANITATION I

I. GENERAL INFORMATION

CODE	**:**	SA115 Environmental Sanitation I
SEMESTER	**:**	7
CREDITS	**:**	4
HOURS PER WEEK	**:**	6 (Theory, Practice)
PREREQUISITES	**:**	HH223 Fluid Mechanics I SA413 Water and Sewerage Analysis
CONDITION	**:**	Mandatory

II. COURSE DESCRIPTION

The course prepares students for the understanding of the relationship between air, water, food and housing with public health and the importance of the availability of drinkable water in rural and urban areas. Students understand and apply methods for the design of drinkable water supply systems for rural areas including pump selection, pipes dimensioning and water treatment according to the type of water source. Students also understand the methods for water disinfection, and final disposal of solid waste.

III. COURSE OUTCOMES

At the end of the course, students:

1. Identify the environment factors affecting people wellbeing and quality of life: clean air and water, efficient and safe waste disposal, food protection, proper housing.
2. Analyze water sources regarding water quantity and quality.
3. Formulate general design of water supply systems in rural areas including pipes, pumps and regulation tank.
4. Understand water treatment process applicable in rural areas.
5. Understand the process for excrete elimination with and without hydraulic trawl in rural areas.
6. Understand the processes for solid waste collection, transport and disposal.

IV. LEARNING UNITS

1. INTRODUCTION

Environmental conditions affecting people wellbeing. Clean and safe water supply. Clean and safe ambient air. Efficient human, animal and industrial waste disposal. Protection of safe food. Adequate housing. Environmental hygiene. Contaminated water as a disease mean. Importance of sanitary education.

2. DRINKABLE WATER SUPPLY IN RURAL AREAS

Norms and regulations. Field study. Necessary information for developing a drinkable water supply project in a rural area. Water endowment and consumption. Population growing in rural areas. Elements of a rural water supply system. Supply sources and catchment types. Selection of water source. Estimation of future population and calculation of design flows.

3. CATHMENT SYSTEMS AND WATER TREATMENT

Catchment types according to water source. Hillside spring boxes. Surface water catchment.

Drinkable water treatment in rural areas. Design of shredders, settlers and slow filtration systems. Disinfection using chlorine and chlorinated compounds.

4. CONDUCTION LINES AND NETWORKS

Conduction lines. By gravity and by pumping. Design of a gravity conduction line including pipe type and class. Design of a pumping conduction line using the method of economic diameter and the Bresse formula. Calculation of volume of regulation reservoir. Types of reservoirs. Reservoir dimensioning and construction materials. Design of water distribution networks using the sectioning method. Home connection. Public pool.

5. EXCRETA ELIMINATION

Excreta elimination without hydraulic trawl. Sanitary latrines. Construction considerations. Excreta elimination with hydraulic trawl. Septic tank and pre-collation system. Design criteria of this type of evacuation system.

6. STABILZIATION PONDS AND SEWAGE ELIMINATION

Stabilization ponds. Types: primary, secondary, anaerobic. Aspects to be taken into account in rural areas regarding alimentation patterns.

Sewage elimination in rural areas: recollection, transport and disposal. Equipment and machines. Equipment operation and maintenance.

V. PRACTICE WORK

Work 1. Future population estimation
Work 2. Design of conduction line and distribution networks
Work 3. Non-conventional methods for solid waste recollection
Work 4. Design of septic tank

V. METHODOLOGY

The course develops through theory, practice and laboratory sessions. In theory session, the instructor presents the concepts and methods. In practice sessions, students solve different problems related to water supply and consumption, piping systems, distribution networks. At the end of the course, students present a report on a relevant theme of the curse. Active student participation is encouraged throughput the course.

VI. EVALUATION FORMULA

The average grade PF is calculated as follows:

PF = (EP + EF + PC) / 3

EP: Mid term exam EF: Final exam
PC: Average of quizzes including final report

VII. BIBLIOGRAPHY

1. **MANUAL OF HYDRAULICS**
   Azevedo Netto, Acosta Alvarez
   McGraw Hill Interamerican. Mexico

2. **URBAN AND RURAL SANITATION**
   Ehlers and Steel
   McGraw Hill Interamerican. Mexico

3. **TREATMENT OF DRINKABLE WATER IN RURAL AREAS**
   Panamerican Center of Sanitary Engineering and Environmental Sciences.