



NATIONAL UNIVERSITY OF ENGINEERING

COLLEGE OF CIVIL ENGINEERING

CIVIL ENGINEERING PROGRAM

HH413 – IRRIGATION

I. GENERAL INFORMATION

CODE	: HH413 - Irrigation
SEMESTER	: 10
CREDITS	: 04
HOURS PER WEEK	: 06 (Theory – Practice)
PREREQUISITES	: HH333 – Hydraulic and Hydrology
CONDITION	: Mandatory

II. COURSE DESCRIPTION

This course prepares the student in the basic knowledge of irrigation systems, for which guidelines are given for the analysis and design of the hydraulic structures involved in said system. Likewise, the student is provided with knowledge of new technified irrigation systems and the implication or repercussion of this type of works with the environment. The student is prepared in the management of water resources in irrigation projects.

III. COURSE OUTCOMES

At the end of the course the student will:

- Understand the importance of agriculture throughout the history of Peru, since pre-Inca times.
- Understand how the demand for irrigation water for different crops is determined.
- Sizes small dams for irrigation projects.
- Design the major and minor irrigation infrastructure of a small irrigation project.
- It develops a small irrigation project, and evaluates its economic and environmental viability.

IV. LEARNING UNITS

1. INTRODUCTION / 8 hours

Importance of irrigation water in the history of Peru / Main special projects in the country / Description of an irrigation project.

2. BASIC STUDIES IN AN IRRIGATION PROJECT / 8 hours

Irrigation water quality / Agricultural land / Description of the volumetric demand of water by crop, irrigation module.

3. DAMS AND PACKINGS / 6 hours

Classification / Types / Main dams in Peru and the world / Characteristic levels of a reservoir / Hydraulic sizing.

4. WATER CONDUCTING AND DRIVING SYSTEM / 14 hours

Water intake / Filters / Channels, other structures in irrigation systems / Classification, types, hydraulic design.

5. IRRIGATION SYSTEMS / 8 hours

Gravity irrigation / Technified irrigation / Pumping irrigation / Irrigation by underground well.

6. ENVIRONMENTAL IMPACT STUDY / 6 hours

Impact of the project with the environment

7. OPERATION, MAINTENANCE, AND ECONOMIC ANALYSIS / 6 hours

Guidelines for the operation and durability of the Hydraulic Works / Economic viability of an irrigation project.

V. LABORATORIES AND PRACTICAL EXPERIENCES

Structured work related to irrigation

VI. METHODOLOGY

The course is developed in sessions of theory, practice and / or field visits. The theory sessions are complemented and strengthened with the presentation of videos. In the practical sessions, students apply theoretical knowledge to real situations in our country. In seminar sessions students are assisted to apply the concepts learned, aimed at exercising them in the formulation and evaluation of an irrigation project at the profile and / or constructive level. At the end of the course the student must prepare and present a group work of irrigation of social interest.

VII. EVALUATION FORMULA

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

- Partial Exam (PE): Weight 1
- Final Exam (FE): Weight 1
- Average of Practices (P): Weight 1.

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

VIII. BIBLIOGRAPHY

- Allen, Richard. (2006). Evapotranspiration of the crop. UN: United Nations Organization, Rome.
- Garcia, Eduardo. (2009). Practical Manual of Small Irrigation. Peru: Peru - Germany Fund, Lima.
- Carrazón, Julián (2007). Practical Manual for the Design of Mini-Irrigation Systems. UN: Technologies Series. Tegucigalpa, Honduras
- Santos, Luis (2010). Irrigation and its technologies. Spain: Regional Center for Water Studies.
- U.S. Bureau of Reclamation (1970). Small Dam Project. Spain: Editorial Dossat, Madrid.

- U.S. Department of the Interior (1993). Channels and Related Structures. U.S. Bureau of Reclamation USA: U.s. Bureau of Reclamation, Colorado.
- Waller Peter (2016), Irrigation and Drainage Engineering. USA: Springer International Publishing Editorial. Arizona.