ICH2114 HYDRAULIC ENGINEER

Credits and contact hours:	10 UC credits/ 10 hours (4,5 h. Lectures / 0,5 h. Assistanship / 5 h. Independent learning experiences
Instructor's name:	Francisco Ignacio Suárez Poch
Course coordinator's name	Francisco Ignacio Suárez Poch
Textbook:	Munson, B.R., Young, D.F. y T.H. Okiishi. 2002. Fundamentals of Fluid Mechanics. 4a Ed. John Wiley & Sons Inc. New York.
Course Catalog Description:	This course introduces the students to different applications of hydraulic engineering, training them to use the basic principles of fluid mechanics in the analysis of open channel flow and viscous flow in pies. The students also learn how to design channels and pipe systems.
Prerequisite Courses:	ICH 1104 Fluid Mechanics
Co-requisite Courses:	None
Status in the Curriculum:	Required

Course Learning Outcomes:

1. Apply the principles of continuity, energy and momentum to incompressible steady-state flows in open channels and pipes.
2. Design channels in uniform flow.
3. Analyze and design flumes, energy dissipaters, weirs, and other hydraulic structures used for distribution and flow control in open channels.
4. Characterize and calculate gradually varied flow in streams and open channels.
5. Identify and design turbines and pumps commonly used in hydraulic systems.
6. Develop laboratory activities through collaborative team work.

Relation of Course to ABET Criteria:

a. Knowledge of mathematics, science and engineering
b. Design and conduct experiments: analyze and interpret data
c. Design a system, component, or process
d. Multidisciplinary teams
e. Identify, formulate, and solve engineering problems
k. Techniques, skills, and modern tools for engineering practice.

Topics covered:

1. INTRODUCTION

1.1 Transport and distribution systems in hydraulic engineering.
1.2 Conservation laws: continuity, energy and momentum.
1.3 Bernoulli equation: total energy line, hydraulic grade line

2. OPEN CHANNEL FLOW
2.1 Flow classification.
2.2 Characteristics of open channel flow
2.3 Energy conservation and its applications. Specific energy, critical flow, waves, controls, channel transitions.
2.4 Momentum conservation and its applications. Specific momentum. Hydraulic jump. Rapidly varied flow.
2.5 Hydraulic structures: underflow gates, weirs.

3. UNIFORM FLOW: DESIGN OF CHANNELS
3.1 Uniform flow.
3.2 Flow resistance and surface roughness.
3.3 Uniform or normal depth and normal velocity.
3.4 Types of channels and design elements. Channel sections of optimum shape.
3.5 Stability of channels.
3.6 Design and layout of channels.

4. GRADUALLY VARIED FLOW
4.1 Basic assumptions and the equation of gradually varied flow.
4.2 Characteristics and classification of gradually varied flow.
4.3 Control sections.
4.4 Computation of gradually varied flow.

5. VISCOUS FLOW IN PIPES
5.1 Continuity and energy principles in single pipe systems.
5.2 Major and minor energy losses, characteristic curves.
5.3 Multiple pipe systems.
5.4 Irrigation systems.
5.5 Open distribution networks.

6. TURBOMACHINES
6.1 Turbines.
6.2 Pumps.
6.3 Pump performance characteristics and system characteristics.
6.4 Pump selection, arrangements of pumps.
6.5 Centrifugal pumps: ideal head rise.