NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF ENVIRONMENTAL ENGINEERING
ENVIRONMENTAL ENGINEERING PROGRAM

HH223 – FLUID MECHANICS I

I. GENERAL INFORMATION

CODE : HH223 Fluid Mechanics I
SEMESTER : 4
CREDITS : 4
HOURS PER WEEK : 6 (Theory – Practice)
PREREQUISITES : AA231 Mathematics III
CONDITION : Compulsory

II. COURSE DESCRIPTION

This course is theoretical and practical and provides students with the main fundamentals and concepts of the characteristics of the behavior of fluids at rest and in motion under given conditions and considerations. Its general objective is to describe and explain phenomena related to fluid mechanics and their corresponding applications and to provide the basis for the development of the specialty courses.

III. COURSE OUTCOMES

1. Identify the scientific experimental nature of the fluid mechanics and appreciate the rigor and objectivity of the discipline.
2. Work with equations, basic mathematical tools in the study of fluid mechanics.
3. Analyze fundamental laws fluid mechanics and apply them in problematic and specific situation with thoroughness.

IV. LEARNING UNITS

1. FLUID PROPERTIES AND FLUID STATICS / 21 HOURS
Preliminary concepts / Concept of fluid / Dimensions and unities / Physical and thermodynamic properties of fluids / Surface tension / Capillarity / Viscosity / Euler equation / Forces acting on a fluid / Manometrics / Hydrostatic forces acting on plane and curve surfaces / Examples of application / Points about laboratories.

2. FLUID KINEMATICS / 7 HOURS
Stability and flotation / Motion equilibrium / Fluid kinematics / Flow fields / Acceleration curl and velocity vector fields.

3. FLUID DYNAMICS / 70 HOURS
Classification of flows and methods to describe them / Conservation of momentum / Energy equation / Energy loss / Interpretation of Bernoulli's equation / Holes and gates / General equations and loss coefficients / Pitot tube, venture tube and current meter / Dimensional analysis and similarity / Viscous flow in ducts / Flow and duct types / Pipe friction head loss / Flow in ducts / Pressure and underpressure criteria / general aspects of channel flow.

V. LABORATORY EXPERIENCES

Lab 1: Fluid properties: viscosity.
Lab 2: Fluid properties: surface tension.
Lab 3: Manometrics.
Lab 4: Reynolds experience.
Lab 5: Guided technical visit.
Lab 6: Capacity hole discharge.
Lab 7: Outlet discharge.
Lab 8: Outlet calibration using the gravimetric method.

VI. METHODOLOGY

The course is carried out in computing lab, theory and practice sessions. In theory sessions, the instructor introduces concepts, analysis, descriptions and applications. In practice sessions, several problems are solved, and their solutions are analyzed. In lab sessions, debate group research and analysis of solutions are carried out. The handing over of the lab reports will be held before the following session start. In all sessions student's active participation is encouraged.

VII. EVALUATION FORMULA

The average grade PF is calculated as follows:

PF = (EP+EF+((P1+P2+P3+P4)/3+(L1+L2+L3+L4+L5+L6+L7+L8)/8)/2)/3

EP: Mid-Term Exam EF: Final Exam
P#: Quizzes L#: Labs

VIII. BIBLIOGRAPHY

1. **FOX, ROBERT**
   Introduction to Fluid Mechanics (Spanish)
   Mc Graw – Hill. 4th edition (2012)

2. **POTTER, MERLE**
   Fluid mechanics (Spanish)
   Prentice Editorial – May 2nd Edition (2008)

3. **SHAMES, IRVING**
   Fluid mechanics (Spanish)
   Mc. Graw Hill Editorial, 3rd Edition, (2009)

4. **WHITE, FRANK**
   Fluid Mechanics (Spanish)
   Mc. Graw – Hill Editorial, 1st edition (2011)