



Course Program

1.- Credits

6

2.-Prerequisites

ING 2101 Differential Equations

ING 2204 Static

3.- Corequisites

IOC 4103 Hydraulic

4.-Time Distribution

3 sessions/week, 1.7 h/session

2 practical sessions / week, 1.7 H /

session 1 laboratory/ week, 1.7 h/ Lab

5.- Description

This is a fundamental course that includes an introduction to basic concepts and applications of fluid mechanics, including: fluid statics, fluid kinematics, finite control analysis, differential analysis, dimensional analysis and a brief introduction to flow over immersed bodies.

The course includes 2 midterms, one final exam, and 6 quizzes, scheduled through the semester (see Syllabus). It also includes 3 laboratory experiences evaluated through lab reports. For most classes, there will be reading assignments, that will be evaluated through on line quizzes.

The course consists of theoretical classes, recitation hours and laboratory classes. The laboratory classes are mandatory. The recitation classes are focused in exercises, and they are taught by a teaching assistant student.

The laboratory experiences are evaluated with lab reports done in work groups.

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6.- Competencies

At the end of the semester the student should be able to:

- Understand Basic Concepts of fluids and their
- behavior
- Develop fluid behavior models, using an integral or differential approach
- Understand and apply models to simple fluid mechanics problems, considering their limitations and strengths

7.- Contribution to Exit Profile

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- Deep knowledge in basic sciences and engineering sciences, and ability to apply them
- Ability to identify and formulate open engineering problems, as well as to combine theory and practice in their solution.
- Ability to communicate in writing effectively in both Spanish and English, especially on topics related to their profession
- Knowledge of the theoretical bases in the area of hydraulics

8.- Main Contents

Introduction

Properties of fluids. Fluids as a continuum. Dimensions and units. Density, specific weight, specific volume and specific gravity. Viscosity, compressibility and Elasticity. Temperature influence, vapor pressure, surface tension and capillarity.

Fluid Statics

Pressure in a point. Basic equation for pressure field. Measurement of pressure. Manometry. Hydrostatic force on a plane surface. Hydrostatic force on a curved surface. Buoyancy, flotation and stability.

Fluid Kinematics and Fluid Dynamics

Newton's second law. Energy line. Velocity field, acceleration field. Streamlines, streak lines and path lines. Rotation and vorticity. Inviscid flow, Euler's equation of motion, the Bernoulli equation, irrotational flow.

Differential Analysis of Fluid Flow

Fundamentals of viscous flow. Stress-deformation relationships. The Navier-Stokes Equation. Applications of the Navier-Stokes equations.

Finite Control Volume Analysis

Control volume approach. Reynolds transport theorem. Conservation of mass, linear momentum and energy.

Dimensional Analysis, Similitude and Modeling

Fundamentals for dimensional analysis. Buckingham Pi theorem, determination of Pi terms. Common dimensional groups in fluid mechanics. Correlation of experimental data. Modeling and similitude

Flow Over Immersed Bodies

Boundary layer, drag and lift

9.- Assessment

The course evaluation consists of two midterms, 6 quizzes, lab reports, reading assignment evaluations and one final exam:

Midterms: there will be two midterms throughout the semester. In each midterm, the students should be able to demonstrate deep understanding of each of the topics evaluated.

The evaluations will be graded from 1.0 to 7.0. Once the grades are posted in the course site, a date, time and place will be scheduled for students to revise their midterm. If any discrepancies are found by the student, they will be presented in writing only on that day and time, so make sure you attend that day.

Midterm 1 weights 20% from the final grade, while Midterm 2 weights 25% of the final grade.

Reading Assignment Evaluations: there will be several on line reading evaluations throughout the semester. Reading pages are posted in the Tentative Course Schedule document posted on SAF. The online tests will be posted in a limited window of time on SAF. Students cannot erase any of the online quizzes. The average quizz grade weights 5% of the final grade.

Quizzes: there will be six quizzes throughout the semester. Most of them will be taken in Recitation hours. Students have the chance to erase one of those quizzes, so the final quiz grade takes into account the average grade of the other five. No matter the reason there is no repetition of quizzes. The average quizz grade weights 10% of the final grade.

Final Exam: The final exam counts for 30% of the final grade. All contents from the semester will be evaluated in the Final Exam. All students with average grade 5.5 or above will reach exemption from the Final Exam. This grade is calculated taking into account midterms, quizzes, lab grades and reading assignment evaluations.

10.- BasicBibliography

This course use the following guide textbook as main reference: Title:

A Brief Introduction to Fluid Mechanics, Fifth Edition Author:

Young, Munson, Okiishi and Huebsch

11.- Supplementary Bibliography

Other books useful for this course (Available in the main Library):

- White, F., Fluid Mechanics. UAndes ID 620.106 W582f.E (14 volumes andn library) Munson, B.
- Fundamentals of fluid mechanics. UAndes ID 620.106 M969f
- Shames, I. H., Mechanics of Fluids
- Streeter V., Fluid Mechanics/Fluid Mechanics
- Chow V.T. Hydraulic of Channels Open (trad. Juan Saldarriaga) Sturn,
- T.W., Open Channel Hydraulics