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FREE UNIVERSITY PEREIRA SECTION

UNDERGRADUATE PROGRAM IN ENVIRONMENTAL ENGINEERING

SUBJECT: **FLUID MECHANICS I**

CODE: **----------**

SEMESTER: **FIFTH**

HOURS **WEEKLY: 4**

THEORETICAL: 4

PRACTICES: 0

REQUIREMENTS: **PHYSICS III,**

CALCULUS IV,

ADVANCED MATHEMATICS

GOALS.

To ensure that the student obtains the necessary knowledge of the behavior of the fluids, so that it allows you to address the courses in hydraulics and fluid mechanics II with a solid conceptual basis.

METHODOLOGY.

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The course will be developed with master lectures by the professor on the content basics of the subject; for their part, students will strengthen their knowledge of the subject through recommended readings, consultations with the teacher and problem solving of application.

WORK PROGRAM.

1. PROPERTIES OF FLUIDS

- Definition of fluid
- Units of force, mass, length and time
- Viscosity
- Continuous medium
- Density, specific volume, specific weight, relative density and pressure.
- Surface tension

2. FLUID STATICS

- Pressure at a point
- Basic equation of fluid statics
- Units and scales for pressure measurement

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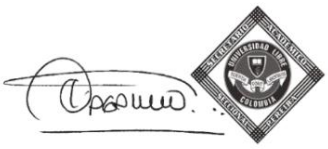
- Pressure gauges
- Forces on flat surfaces
- Components of forces on curved surfaces
- Buoyant force
- Stability of floating and submerged bodies
- Relative equilibrium



3. BASIC EQUATIONS AND CONCEPTS OF FLUID FLOW

- Flow characteristics; definitions
- System and control volume concepts
- Application of control volume to continuity, energy and momentum
- Continuity equation
- Euler's equation of motion along a path
- Bernoulli's equation
- Reversibility, irreversibility and losses
- Steady-state energy equation
- Relationship between Euler's equation and thermodynamic relations
- Application of the energy equation to cases of steady-state fluid flow
- Applications of the linear motion equation
- Momentum equation of momentum

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4. DIMENSIONAL ANALYSIS AND DYNAMIC SIMILARITY

- Dimensional homogeneity and dimensionless relationships
- Dimensions and units
- Theorem II
- Analysis of dimensionless parameters
- Similarity: studies with models

5. VISCOUS FLOW: PIPES AND CHANNELS

- Laminar and turbulent flow; internal and external flow
- Navier-Stokes equations
- Incompressible laminar flow at steady state between parallel plates
- Laminar flow in pipes and annulus
- Relations for turbulent shear stress

Turbulent flow in open and closed ducts

- Uniform flow at steady state in simple pipes
- Minor losses
- Lubrication mechanics

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LITERATURE.

STREETER VL, WYLIE EB, Fluid Mechanics, McGraw-Hill.

SHINBROT MARVIN, Lectures on fluid mechanics, Science Publishers

VENNARD AND STREET, Elementary Fluid Mechanics