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COURSE: Fluid Mechanics

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ACADEMIC YEAR: 2019-2020

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TYPE OF EDUCATIONAL ACTIVITY: Basic

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TEACHER: Michele Greco

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website:

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mobile (optional): +39 329 3178389

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Language: Italian/English

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ECTS: 9

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n. of hours: 90

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Campus: Potenza

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Semester: I and II

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#### EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

Students graduating will be able to: Explores fluid properties, hydrostatics, fluid dynamics, similitude, energy and momentum principles, closed conduit flow, open channel flow, flow measurement and unsteady flows. Includes exercises in flow measurement, open channel flow, pipe friction, physical modeling, and data collection.

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#### PRE-REQUIREMENTS

Physics and Mathematics

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#### SYLLABUS

##### *Properties of fluids (6 HOURS):*

- Mechanical quantities and units of measurement.
- Internal stresses in continuous systems and tensor properties.
- Compressibility, viscosity, density, steaming pressure.
- Equation of state.

##### *Hydrostatics (14 HOURS):*

- Stevin law and pressure measurement.
- Hydraulic forces on flat and curved surfaces as well as on immersed bodies.

##### *Kinematics (8 HOURS):*

- Fundamental of fluid kinematics: lagrangian and eulerian description of the fluid flow.
- Uniform, steady and unsteady motion
- Fluid flow: uniform and steady flow
- Average velocity, mass and volume discharge.

##### *Dynamics of ideal fluid (12 HOURS):*

- Ideal fluid dynamics: continuity equation.
- Momentum equations and its applications.
- Bernoulli's theorem and its applications.
- lift, pressure strength.
- Study of water flows.
- Pressure distribution in cross sections
- Flow measurement and speed.

##### *Dynamics of real fluids (12 HOURS):*

laminar motion instability, the boundary layer concept.

- Separation and wakes.
- Shear stresses.
- Boundary layer and turbulent boundary layer
- Forces and energy dissipation in turbulent motion, effect of the roughness of the wall.
- Moody's abacus.

*Pipeline flows (10 HOURS):* analysis of the problem of uniform

*Unsteady flows (16 HOURS):* mass oscillations and water hammer

*Open channel flows (12 HOURS).*

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#### TEACHING METHODS

Theoretical lessons and tutorials

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#### EVALUATION METHODS

- N.2 intermediate verifications which can be recognised like ongoing tests and once passed both can be considered as written examination with maximum scoring of 25/30,
- Oral examination.

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#### TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

D. Citrini, G. Nosedà. *Idraulica*. C.E. Ambrosiana, Milano, 1987  
V. Marone *Idraulica*, Liguori Editore  
A. Ghetti, *Idraulica*, Edizioni Libreria Cortina, 1987

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#### INTERACTION WITH STUDENTS

Available assistance before and after class time, in office from 9.00 to 11.00 every Monday. However the Professor is willing to support student even fixing appointment by or through e-mail

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#### EXAMINATION SESSIONS (FORECAST)<sup>1</sup>

17/06/2020 – 15/07/2020 - 16/09/2020 – 20/10/2020 – 25/11/2020

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SEMINARS BY EXTERNAL EXPERTS    YES     NO

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#### FURTHER INFORMATION

Opportunity to carry on thesis work on topics related to the Fluid Mechanics, theoretically and experimentally both physical and numerical, even connected to other courses. The main topics refer to open channel flow dynamics in rivers, monitoring and modelling of open channel flows, water resources planning and hydraulic risk assessment and management.

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<sup>1</sup> Subject to possible changes: check the web site of the Teacher or the Department/School for updates.