Università degli Studi della Basilicata
Scuola di Ingegneria

COURSE: Applied Hydraulics

TEACHER: Dott.Marilena Pannone/Dott. Domenica Mirauda

e-mail: marilena.pannone@unibas.it, domenica.mirauda@unibas.it

website:

Language Italian (English when needed)

ECTS: 3+3	n. of hours: 27+27	Academic year: 2015-2016	Campus: Potenza	Semester: 1

TOPICS

Steady flow of free surface streams. Measurement of the water discharge in free surface streams. Laboratory experiments for the estimation of the water discharge in free surface streams. Unsteady flow of free surface streams. Potential flows and boundary layer. Derivation of the forces soliciting the bridge peers in river beds. Turbulence, k-ε model and related dispersion processes. Bed and suspended load transport, and interactions with the engineering constructions along a stream. Steady and unsteady groundwater flows. Free surface and confined aquifers. Filtration across soil dams.

TEACHING METHODS (please tick one or more options)

x Theoretical lessons
x Tutorials in classroom
x Tutorials in laboratory
□ Project works
□ Technical visits
Other activities (please specify) _____

TEXTBOOKS

D. Citrini, G. Noseda, Idraulica, Casa Editrice Ambrosiana – Milano.
A. Ghetti, Idraulica, Edizioni libreria Cortina-Padova.
E. Marchi - A. Rubatta, Meccanica dei Fluidi, UTET- Torino
Lecture notes provided by the teachers.

ON-LINE EDUCATIONAL MATERIAL

web address:

LEARNING OUTCOMES

Capability of understanding and solving simple hydraulic problems by numerical or graphical methods, mainly in terms of interaction fluid/engineering constructions; capability of organizing and performing laboratory experiments for the estimation of the flow fields and water discharges in free surface streams.

REQUIREMENTS

Passing the exams of Mathematical Analysis I and II, Physics I and II and Fluid Mechanics before beginning with the Applied Hydraulics classes is highly recommended.

EVALUATION METHODS (please tick one or more options)

□ Intermediate verifications
□ Written examination
□ Discussion of a project work
□ Practical test
x Oral examination
Other methods (please specify) _____

DETAILED CONTENT

Steady flow of free surface streams: definition of the geometrical, kinematic and dynamic variables; flow and continuity equations; empirical relationships for the calculation of the resistance coefficient; rating curves; flow profiles; hydraulic jump. Exercises on flow profiles for real cases.
Measurement of the water discharge in open channel flows: techniques and methods for the evaluation of the

water discharge, description of field and laboratory equipments for the evaluation of the water discharge. Laboratory experiments for the estimation of the water discharge in free surface streams. Unsteady flow of free surface streams; analysis of the flood wave propagation by numerical and graphical methods.
Subsurface flows: definitions and general concepts. Filtrating tunnels, free surface and artesian wells.
Potential flows: potential and stream functions, hydrodynamic grid.
Determination of filtrating flow rate and under-pressures in presence of fluvial barrages. Aquifers: Dupuit hypothesis. Filtration across soil dams. Phenomenon of the suspended source. Unsteady subsurface flows. Exhaustion of a free surface aquifer by a topographic sill. Water level and pressure oscillations in the coastal aquifers.
Solid transport: general concepts and estimation of the bed load rate as a function of the main hydro-dynamic parameters. Stream turbulent core and its interaction with the suspended load transport mechanisms. Stochastic approach and practical evaluation of the suspended load rate.
Digging up of foundations by a stream on a cohesionless bed: involved hydrodynamic mechanisms and outline of the classical methods for the determination of the excavation depth. Determination of drag and lift forces acting on an obstacle lapped by uniform flow resorting to the method of the potential flows.
Boundary layer theory. Laminar and turbulent wall boundary layer. Separation of the boundary layer due to the solid contours curvature and related static and dynamic effects. Shear and shape flow resistances. Total resistance on the bodies lapped by the stream as a function of the Reynolds number.

EXAMINATION SESSIONS (FORECAST)
25/02/16, 29/04/16, 07/07/16, 28/07/16, 22/09/16, 17/11/16

SEMINARS BY EXTERNAL EXPERTS YES □ NO x

FURTHER INFORMATION