UNIVERSITÀ DI PAVIA

Anno Accademico 2017/2018

FLUVIAL HYDRAULICS

Anno immatricolazione	2017/2018
Anno offerta	2017/2018
Normativa	DM270
SSD	ICAR/01 (IDRAULICA)
Dipartimento	DIPARTIMENTO DI INGEGNERIA CIVILE E ARCHITETTURA
Corso di studio	CIVIL ENGINEERING FOR MITIGATION OF RISK FROM NATURAL HAZARDS
Curriculum	Hydrogeological risk assessment and mitigation
Anno di corso	1°
Periodo didattico	Primo Semestre (25/09/2017 - 18/10/2017)
Crediti	6
Ore	51 ore di attività frontale
Lingua insegnamento	English
Tipo esame	SCRITTO E ORALE CONGIUNTI
Docente	GHILARDI PAOLO (titolare) - 6 CFU
Prerequisiti	Basic knowledge of hydraulics or fluid mechanics
Obiettivi formativi	The course will focus on hydraulics of natural streams, solid transport mechanics, and related hydrodynamic processes. The student wll learn to compute free surface profiles in river flows and basic applications of sediment transport dynamics
Programma e contenuti	1. Basics of Natural Streams Hydrodynamics – Momentum and Energy equations, Turbulence and Velocity Distribution in Natural Streams Flows, Secondary Currents and Dip Phenomenon, Velocity and Bed Shear Stress Distribution in Curved Channels, Shear Stress for Unsteady-Nonuniform Flow. 2. Solid Transport Threshold – Hydrodynamic Drag and Lift on a Solid Grain, Threshold Velocity, Threshold Bed Shear Stress, Probabilistic Concept of Entrainment, Threshold of Nonuniform Sediment Motion.

	3. Bed-Load Transport – Empirical Relationships Involving Bed Shear Stress, Discharge or Velocity; Probabilistic Concepts: Einstein's Model, Engelund and Fredsøe's Model; Deterministic Concepts: Bagnold's Model, Fractional Bed Load of Nonuniform Sediments; Sediment Sorting and Streambed Armoring. 4. Suspended-Load Transport – Diffusion Concept: Generalized Advection–Diffusion Equation of Suspended Sediment Motion, Equation for Vertical Distribution of Sediment Concentration, Stratification Effects, Nonequilibrium Sediment Concentration Distribution, Suspended Load. Threshold Condition for Sediment Suspension. Wash Load. 5. Total-Load Transport – Einstein's Model, Bagnold Model, Chang Model. Engelund and Hansen's Model. Ackers and White's Model. Total-Load Transport of Nonuniform Sediments. 6. Bedforms – Ripples, Dunes, Antidunes, Chutes and Pools, Bars. Models for Prediction of Bedforms. Resistance to Flow Due to Bedforms: Einstein's Method, Engelund and Hansen method, van Rijn's Method. 7. Meandering and Braiding – Meander Planform Characteristics, Mathematical Modeling of Meandering Rivers (Ikeda and Nishimura's, Odgaard's). Braided Rivers. 8. Scour: General Scour, Scour Within Channel Contractions, Scour Near Structures. Scour at Bridge Piers and Abutments. Kinematic Model of Horseshoe Vortex. Scour Depth Prediction and Countermeasures.
Metodi didattici	Lectures with slides and multimedia projection; numerical exercises in computer room
Testi di riferimento	• Dey, S., Fluvial Hydrodynamics: Hydrodynamic and Sediment Transport Phenomena, Springer-Verlag, 2014 • Garcia, M., (ed.), Sedimentation Engineering: Processes, Measurements, Modeling, and Practice, Asce Manual and Reports on Engineering Practice No. 110 • Course notes, scientific papers and other material will be provided during the course.
Modalità verifica apprendimento	Oral exam
Altre informazioni	
Obiettivi Agenda 2030 per lo sviluppo sostenibile	$lbl_legenda_sviluppo_sostenibile