UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Architettura
ACADEMIC YEAR	2018/2019
MASTER'S DEGREE (MSC)	ARCHITECTURE AND BUILDING ENGINEERING
SUBJECT	HYDRAULICS WITH PLANT DESIGN APPLICATIONS
TYPE OF EDUCATIONAL ACTIVITY	C
AMBIT	50672-Attività formative affini o integrative
CODE	19665
SCIENTIFIC SECTOR(S)	ICAR/01
HEAD PROFESSOR(S)	TERMINI DONATELLA Professore Ordinario Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	9
INDIVIDUAL STUDY (Hrs)	105
COURSE ACTIVITY (Hrs)	120
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	3
TERM (SEMESTER)	2° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**TERMINI DONATELLA** Monday 11:00 13:00 Stanza propria Tuesday 09:00 13:00 Stanza propria Wednesday 09:00 13:00 Stanza propria Thursday 09:00 13:00 Stanza propria Friday 11:00 13:00 Stanza propria

DOCENTE: Prof.ssa DONATELLA TERMINI

PREREQUISITES	The preliminary knowledge which are necessary to deal with the contents of the subject concern the contents of the mathematical analysis and those of the analytical geometry.
LEARNING OUTCOMES	Knowledge and understanding skills At the end of the course, the student will have all the knowledge necessary to deal with and resolve problems related to hydraulics in an original way. In particular, the student will be able to analyze the behavior and the basic phenomena that influence the hydrodynamic processes of a pressure current; knowledge and understanding of the open-channel flow. Capacity to apply knowledge and understanding The student will acquire the basic knowledge of the hydraulics required for the application of specific analysis methods which are necessary for the design of hydraulic systems and small supply and recirculation systems. Autonomy of judgment Based on the knowledge gained during the course, the student will have the ability of his own analysis necessary to make technical decisions, appropriate to specific and variable needs depending on the spatial scale and time of analysis. Communication Ability: The student will be able to communicate, with completeness and competence, the problems associated with the hydrodynamic processes that frequently occur in the designing of a building; therefore he will be a valid support for the choice of the most appropriate techniques. Learning capability The student will be able to deepen topics related to fluids and their movement. Fluid Static: Calculating the hydrostatic force on flat and curved surfaces. Fluid kinematics: deformation velocity. Basic equations of fluid dynamics. Bernoulli's theorem and fluid dynamics. Pressure currents. Resistance laws. Verification problems and design: short pipes and long pipes. Streams with negative relative pressure. Power exchange between the stream and a hydraulic machine (pump, turbine). Various motion phenomena in pressure currents. Uniform and permanent motion in open-channel flows.
ASSESSMENT METHODS	The student learning will be verified both during the course and at the end of the course. During the course, student learning will be verified by checking the work (individual or group) produced in reference to application cases explained and carried out in the classroom during the laboratory hours. This phase will be positively evaluated by presenting at the end of the course the book (individual or for students groups) containing the application cases (both in printed and in digital formats) discussed and executed in the classroom during the laboratory hours. The final exam at the end of the course aims to evaluate whether the student has acquired knowledge and understanding of the subjects, has acquired interpretative competence and autonomy for judgment of concrete cases. Therefore, this evaluation will be carried out on the basis of two written tests: one relating to problems of verification and/or design of applicative cases regarding both hydrostatics and permanent motion of pressurized currents or open-channel open-flow; the other concerning the basic theoretical concepts. The final vote will be defined on the basis of the oral evaluation and discussion of both tests. The final evaluation will be obtained as the arithmetic mean of the evaluations obtained in the two tests above. In particular, for the first test, the sufficient evaluation (vote 18/30) will be reached when the student shows minimum application skills to solve concrete cases of both hydrostatics and hydrodynamics. For the second test, the sufficient evaluation (vote 18/30) will be reached when the student shows to have acquired the knowledge and understanding of the topics at least in the general lines and the minimum explaining ability. For each test, the rating will increase to a maximum of 30/30, eventually cum laude, when the goals are achieved in an excellent manner. In particular, for the first test the maximum rating of 30/30, eventually cum laude, will be obtained when the student demonstrates ability to solve practical problems in an excellent way. For the second test, the maximum rating of 30/30, eventually cum laude, will be obtained when the student demonstrates that he has gained full knowledge of the arguments of the program, with appropriate language properties.
EDUCATIONAL OBJECTIVES	The student will be able to deepen issues related to fluids and their movement. Hydrostatic: Calculating of the force on a flat surface and a curved surface. Kinematics: deformation velocity. Basic equations of fluid dynamics. Bernoulli's theorem and fluid dynamics. Pressure flows. Resistance laws. Verification problems and design problems: short pipes. Long pipes. Depressed flows. Power exchange between the flow and the hydraulic machine (pump, turbine).

	Various motion phenomena in pressure flows. Uniform and steady motion in open channel flows and filter motions.
TEACHING METHODS	The course will include frontal lessons regarding both on the theoretical bases and the application cases. Hours of didactic laboratory will be provided with case study sessions in the classroom. 60 hours of theoretical lessons and 60 hours for the didactic laboratory are expected.
SUGGESTED BIBLIOGRAPHY	•Citrini D.-Noseda G.; “Idraulica”. Casa editrice Ambrosiana – Milano •Alfonsi G.C., Orsi E., “Problemi di idraulica e meccanica dei Fluidi”, Casa Editrice Ambrosiana – Milano. - Dispense didattiche del docente sugli argomenti trattati durante il corso

SYLLABUS

Hrs	Frontal teaching
1	Introduction
3	Characteristics of fluids and typologies
7	Hydrostatic and force on flat surfaces and curves surfaces
5	Fluid kinematics - deformation velocity
9	Bernoulli’s Theorem
9	Regimes of motion
6	Resistance laws
6	Long pipes
7	Varied motion in pressure flows
5	Uniform and steady motions in open-channel flows
2	Filtration motions

Hrs	Practice
8	Resistance laws: study case
8	Long pipes: study case

Hrs	Workshops
10	Hydrostatic and force on flat surfaces and curves surfaces: study case
10	Bernoulli’s Theorem: study case
8	Regimes of motion: study case
8	Uniform motion in open-channel flows: study case
8	Steady motion in open-channel flows: study case