UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze Agrarie, Alimentari e Forestali
ACADEMIC YEAR	2016/2017
BACHELOR'S DEGREE (BSC)	AGRICULTURAL ENGINEERING
SUBJECT	AGRICULTURAL HYDRAULICS
TYPE OF EDUCATIONAL ACTIVITY	B
AMBIT	50120-Discipline dell'ingegneria agraria, forestale e della rappresentazione
CODE	03774
SCIENTIFIC SECTOR(S)	AGR/08
HEAD PROFESSOR(S)	IOVINO MASSIMO Professore Ordinario Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	8
INDIVIDUAL STUDY (Hrs)	136
COURSE ACTIVITY (Hrs)	64
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	2
TERM (SEMESTER)	2° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**IOVINO MASSIMO** Thursday 09:00 13:00 Dipartimento di Scienze Agrarie, Alimentari e Forestali, Viale delle Scienze ed. 4, ingr. E, stanza n. 128

DOCENTE: Prof. MASSIMO IOVINO

PREREQUISITES	Basics of physics and mathematics (physical quantities and units systems, vector, force, work, energy, basics trigonometry)
LEARNING OUTCOMES	Knowledge and understanding Knowledge of principles of hydrodynamics to design basic hydraulic installations; knowledge of principles of soil hydrology and watershed hydrology; students will be able to use terminology specific of Physics, Hydraulics and Hydrology. Applying knowledge and understanding Students will be able to solve practical problems in Hydraulics and Hydrology with specific focus on design of simple pipeline networks, scheduling of irrigation and flow prediction. Making judgements Students will be able to choose among different solutions and materials in designing hydraulic structures for farms and agro-industries. Students will be able to gather data and elaborate them according to the specific methodologies of Hydraulics and Hydrology. Communication Students will be able to work as part of a team and to present the results in a professional way to other experts in the field of Hydraulics and Hydrology. Lifelong learning skills Students will be able to attend specialist courses in the field of Agricultural Hydraulics, to keep u-to-date by examining the scientific literature of the specific sector and attending post-graduate courses.
ASSESSMENT METHODS	Final exam consists of an oral discussion on the subjects studied during the course with specific consideration of the practical exercises. A minimum of three questions will be posed to assess student's ability and autonomy in solving practical cases. Grades range from 18 to 30. Minimum mark (18) is reached when student shows a general knowledge and understanding of course subjects and ability to face very simple practical cases. Below this threshold the exam is not passed. The more the student will show knowledge and understanding of the subjects and autonomy in applying them to practical cases related to professional contest, the higher the mark will be.
EDUCATIONAL OBJECTIVES	The course of Agricultural Hydraulics gives the theoretical-applicative basis of Hydraulics and Hydrology necessary to perform design of irrigation system and to understand and quantify the terms of surface water balance. Hydraulics includes: Hydraulic losses, pressurized pipe flow, uniform flow in open channels, discharge measurement methods); Hydology includes: soil hydraulic properties, evapotranspiration, filtration flow. Course include applicative exercises on technical cases of specific importance for the Agronomist professional competence.
TEACHING METHODS	The course includes frontal lessons and practical exercises for at least 20% of the classes.
SUGGESTED BIBLIOGRAPHY	V. Ferro. Elementi di Idraulica ed Idrologia per le scienze agrarie, ambientali e forestali. McGraw-Hill, Milano. Materiale didattico distribuito dal docente durante il corso.

SYLLABUS

Hrs	Frontal teaching
7	Hydrology. Water cycle. Rainfall and surface runoff measurements. Indirect study for determination of streamflow discharge. Stormwater discharge. Collection and elaboration of rainfall data.
4	Basics of Physics and physical properties of water. Units and units systems. Cinematics, Statics and Dynamics. Work and energy. Power. Stress in material continuous systems. Specific weight, density, viscosity, surface tension. Capillarity.
4	Hydrostatics. Relative pressure and absolute pressure. Differential and integral equations of hydrostatics. Pressure gauges.
4	Hydrodynamics. Water flow classification. Continuity equation. Bernoulli equation. Flow of an ideal liquid: piezometric line and energy line.
6	Pressurized pipe flow. Hydraulic losses. Hydraulic computation of short pipes.
2	Pipelines (long pressurized pipes). Hydraulic computation of pipelines. Hydraulic computation of simple pipeline networks.
4	Pumping systems. Pumps characteristics. Hydraulic computation of a pumping system.
2	Open-channel flow. Hydraulic computation of an open channel under uniform flow conditions. Basics of gradually varied flow in open channels.
2	Spillway and discharge measurement methods. Sharp-edged and broad-edged spillway. Weirs and sluice gates.

SYLLABUS

Hrs	Frontal teaching
7	Agricultural hydrology. Soil water content and potential. Water retention curve. Reference and standard evapotranspiration. Water movement in saturated/unsaturated soil. Darcy law. Infiltration. Types of aquifers. Phreatic and artesian wells.

Hrs	Practice
4	Determination of total annual streamflow and stormwater discharge for a small watershed
2	Pressure distribution in a water reservoir. Pressure measurement.
4	Hydraulic computation of a short pipe. Determination of maximum water flow in a pipe under negative pressure.
4	Hydraulic computation of pipelines. Design of a pipeline.
2	Hydraulic computation of a pumping system.
4	Hydraulic computation and design of an open channel.
2	Determination of reference and standard crop evapotranspiration.