



IDENTIFYING DATA

Hydraulics

Subject	Hydraulics			
Code	P03G370V01404			
Study programme	(*)Grao en Enxeñaría Forestal			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	9	Mandatory	2nd	2nd
Teaching language				
Department				
Coordinator	Martínez Chamorro, Enrique José			
Lecturers	Martínez Chamorro, Enrique José			
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General description	(*)1. Hidrostática. Ecuación fundamental de la hidrostática. Centro de presión. Fuerza de presión sobre superficies planas y curvas. Principio de Arquímedes. 2. Hidrodinámica. Ecuación de continuidad. Ecuación de Bernouilli generalizada. Potencia de una máquina hidráulica. Ecuación de la cantidad de movimiento en régimen permanente. 3. Transporte de agua en conducciones cerradas: tuberías. Pérdidas de carga continuas y singulares. Ecuación de Darcy-Weissbach. Timbraje en tuberías. Tuberías en serie y en paralelo. 4. Régimen no estacionario de los líquidos en tuberías. Golpe de ariete. Cálculo de sobrepresiones. 5. Diseño hidráulico en tuberías especiales para riego. Cálculo de ramales principales y laterales. 6. Elevación e impulsión de líquidos mediante bombas hidráulicas. Curvas características. Elección de bombas. 7. El ciclo hidrológico I: precipitación, interceptación y evapotranspiración.			

Competencias

Code			
B2	CG-02: Capacidade para comprender os seguintes fundamentos necesarios para o desenvolvemento da actividade profesional: Físicos.		
B26	CG-26: Coñecementos das seguintes materias necesarios tanto para a xestión dos sistemas forestais como para a súa conservación: hidráulica.		
C9	(*)CE-09: Capacidade para coñecer, comprender e utilizar os principios de: hidráulica forestal; hidroloxía e restauración hidrolóxico-forestal.		
D6	(*)CBI 6: Adquirir capacidade de resolución de problemas.		

Learning outcomes

Expected results from this subject	Training and Learning Results		
(*)	B2 B26	C9	D6
New			

Contents

Topic		
Subject 1	Physical properties of liquids. Concept and properties of hydrostatic pressure. Systems of measurements. Units	
Subject 2.	Basic equation of the hydrostatic. Hydrostatic pressure force on flat and curved surfaces. Pressure center. Archimedes' principle	

Subject 3.	Design and calculation of dikes in forest hydrology: Forces acting. Conditions of stability. Dimensioning. Design of small dams. Concrete dams and glazed masonry
Subject 4.	Current regimes. Concepts used in the definition of movement. Flow and average speed. Continuity equation. Dynamics of perfect liquids. Equation of the amount of movement in steady state. Equation of Bernoulli. Permanent movement. Graphical representation of the Bernoulli equation. Emptying time of a deposit
Subject 5.	Generalized Bernoulli equation. Loss of load. Power of liquid current in a section. Extension of the Bernoulli equation to permanent real currents. Hydraulic machines: turbines and pumps. Power of a hydraulic machine.
Subject 6.	Measurement of capacity in watercourses: Landfills. Types. Classification. General equation of expenditure. Thin wall dumps. Landfills in thick wall. Flow gauging devices in forest basins.
Subject 7.	Water transport in closed pipes. Reynolds number. Boundary layer Laminar and turbulent regimes in pipes. Continuous load losses. Darcy-Weisbach equation. Coefficient of friction. Diagram of Moody. Monomial exponential empirical formulas. Unique or secondary loss of load. Coefficients k for their estimation. Method of length of equivalent pipe.
Subject 8.	Calculation of pipelines. General conditions. Calculation of a siphon. Timbre in pipes. Simple piping in series, in parallel. Introduction to the calculation of branched pipes.
Subject 9.	Non-stationary regime of liquids in pipes. Water hammer. Description of the phenomenon. Calculation of overpressures. Close quick. Allievi's formula. Slow closing. Michaud's formula. Methods of attenuation.
Subject 10.	Hydraulic design in special pipes for irrigation. Characteristic curves of the emitters. Pipes with discrete flow distribution. Criteria and calculation for the dimensioning of a side of sprinklers. Drip irrigation ditto
Subject 11.	Lifting and discharge of liquids by hydraulic pumps I. Classification of hydraulic pumps. Centrifugal pumps. Geometric and elevation heights of elevation. Characteristic curve. Powers and yields. Loss of energy. Suction height. NPSH Factor. Non-cavitation condition.
Subject 12.	Lifting and flow of liquids using hydraulic pumps II. Characteristic curves of rotodynamic pumps at constant speed. Operating point. Couplings. Formulas of similarity. General characteristics curves at different speeds. Choice of pumps.
Subject 13.	Flow in open channels. Permanent and uniform movement. Vertical velocity distribution. Normal draft. Gradually varied permanent movement. Specific energy. Depth, speed and specific energy critical. Hydraulic overhang.
Subject 14.	Hydrological cycle. Forest action on water regulation. Physical parameters of the hydrological basin. Soil and climate. Forest action on water regulation. Hydric balance. Criteria for restoring forest hydrological degraded areas.

Planning

	Class hours	Hours outside the classroom	Total hours
Troubleshooting and / or exercises	30	45	75
Laboratory practises	10	10	20
Autonomous troubleshooting and / or exercises	0	60	60
Master Session	20	20	40
Troubleshooting and / or exercises	4	26	30

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Troubleshooting and / or exercises	Activity which formulated problem and / or exercises related to the course. The student should develop appropriate solutions or right through the exercise routines, application of formulas or algorithms, application processing procedures available information and interpretation of the results. It is often used to complement the lecture.
Laboratory practises	Activities application of knowledge to specific situations and basic skills acquisition and related procedural matter under study. Special spaces are developed with specialized equipment (scientific and technical laboratories, languages, etc.).
Autonomous troubleshooting and / or exercises	Actividade in which problems are formulated and / or exercises related to the course. The student must develop the analysis and resolution of problems and / or exercises independently.

Master Session Presentation by the teacher of the contents on the subject under study, theoretical and / or guidelines for a job, exercise or project to be developed by the student.

Personalized attention

Methodologies	Description
Autonomous troubleshooting and / or exercises	
Troubleshooting and / or exercises	

Assessment

	Description	Qualification	Training and Learning Results		
Autonomous troubleshooting and / or exercises	(*)Planteamiento de problemas que el alumno debe resolver de forma personalizada fuera de clase a lo largo del curso	30	B2 B26	C9	D6
Troubleshooting and / or exercises	(*)Planteamiento de problemas que el alumno debe resolver en clase en el acto de evaluación	70	B2 B26	C9	D6

Other comments on the Evaluation

Sources of information

Basic Bibliography

Complementary Bibliography

MOTT R.L., **Mecánica de fluidos**, Pearson. Prentice Hill-Mexico,
 GILES, R.V., **Mecánica de los fluidos e hidráulica**, McGraw-Hill,
 TARJUELO, J. M., **Hidráulica general aplicada**, Serv. Publicaciones E.U. Politécnica de Albacete,
 ESCRIBÁ BONAFÉ, **Hidráulica para ingenieros**, Bellisco,
 SALDARRIAGA, J, **Hidráulica de tuberías abastecimiento de agua , redes y riegos**, Alfaomega,
 AGÜERA SORIANO, J., **Mecánica de fluidos incompresibles y turbomáquinas hidráulicas**, Ciencia,
 MATAIX, C., **Mecánica de fluidos y máquinas hidráulicas**, Del Castillo,
 WHITE, F. M., **Mecánica de fluidos**, McGraw-Hill,
 LUIS A, **Materiales y cálculo de instalaciones. Biblioteca de instalaciones de agua, gas y aire acondicionado**, CEAC,
 HERNÁNDEZ, A. y otros, **Manual de saneamiento Uralita**, Thomsosn Paraninfo,
 SUAREZ, J. MARTINEZ, F., PUERTAS, J., **Manual de conducciones Uralita**, Thomsosn Paraninfo,
 FUENTES YAGUE, **Técnicas de riego**, IRYDA.,
 RODRIGO, J. y CORDERO ,L, **Riego localizado**, Mundi prensa,
 DAL -RE, R., **Pequeños embalses de uso agrícola**, Mundi prensa,
 AMIGO, E. y AGUILAR, E., **Manual para el diseño construcción y explotación de embalses impermeabilizados con geomembranas**, Gobierno de Canarias,
 LLAMAS, J., **Hidrología General**, Servicio editorial. Univ. Pais Vasco,
 LOPEZ CADENAS, F., **Restauración hidrológico-forestal de cuencas y control**, Tragsa-Tragsatec/Mº. Medio Ambiente/ Mundi-Prensa,
 LOPEZ CADENAS, F. y MINTEGUI J.A., **Hidrología de superficie**, E.T.S.I.M. Madrid,

Recommendations

Subjects that it is recommended to have taken before

Physics: Physics I/P03G370V01102
 Physics: Physics II/P03G370V01202
 Mathematics: Overview of mathematics/P03G370V01203
 Mathematics: Mathematics and IT/P03G370V01103