



Universitat de Lleida

DEGREE CURRICULUM
FLUID MECHANICS

Academic year 2013-14

Subject's general information

Subject name	Fluid Mechanics
Code	102112
Semester	2n Q Avaluació Continuada
Typology	Obligatòria
ECTS credits	6
Theoretical credits	0
Practical credits	0
Department	INFORMÀTICA I ENGINYERIA INDUSTRIAL
Important information on data processing	Consult this link for more information.
Office and hour of attention	Despatx 2.08 EPS en horaris a convenir

Subject's extra information

In order to successfully follow the course it is strongly recommended to refresh the basic concepts of physics and calculus. Some of the problems proposed during the course will require the use of numerical computational techniques, and for that reason it is greatly valuable the ability to use a programmable pocket calculator or having the knowledge of some programming language (Basic, Fortran, C, Matlab,...). The default language used in the course will be Matlab, available at the computers from the EPS.

A fluid is a state of matter aggregation characterized by the property of adopting the form of the vessel which contains it, and mainly refers to liquids and gases. The Fluid Mechanics is the wide branch of physics concerned with the phenomena related to fluid movement. In the present course, based on physics and on differential and integral calculus, the basic principles of the mechanics of incompressible fluids will be explained using a deductive conceptual approach. The course is planned for the second semester and is structured in 3cr theory, 2cr problem solving, and 1cr practicum. The practicum will be in reduced groups at the laboratory by the end of the semester.

Learning objectives

see competences

Competences

Degree-specific competences

- Knowledge of applied thermodynamics and heat transmission, and of the basic principles and their application to the solution of engineering problems.

Goals

- Without Translate - Saber aplicar els conceptes bàsics de la Termodinàmica a la resolució de problemes.

- Knowledge of the basic principles of fluid mechanics and their application to the solution of problems in the field of engineering. Calculation of pipelines, channels and systems of fluids

Goals

- Without Translate - Adquirir els coneixements bàsics de la mecànica de fluids i ser capaç d'aplicar-los a la resolució de problemes pràctics i a l'anàlisi de la fiabilitat dels resultats trobats.

Degree-transversal competences

- Ability to gather and interpret relevant data in their field of study, and to emit judgements that include a reflection on relevant themes of a social, scientific or ethical nature

Goals

- Without Translate - Ser capaç de valorar aspectes de l'impacte social d'una determinada proposta tècnica.

- Ability to work under pressure and/or in situations where there is a lack of information.

Goals

- Without Translate - Ser capaç de plantejar hipòtesis restrictives o simplificadores quan manca

informació fiable.

- Ability to resolve problems and elaborate and defend arguments inside their field of study

Goals

- Without Translate - Ser capaç de plantejar problemes i argumentar l'estratègia de resolució.

Subject contents

Lesson 1 HYDROSTATICS

1. Properties of fluids
2. Pressure. Definition and properties. Absolute and relative pressure
3. General equation of hydrostatics
4. Pressure force on submerged surfaces
5. Instruments for measuring the pressure

Lesson 2 HYDRODYNAMICS

1. Basic concepts. The continuity equation
2. The energy or Bernouilli equation
3. Applications of the Bernouilli equation
 - Tubs of Pitot, Prandtl and Venturi
 - Diaphragm and nozzle
 - Fluid flow through a thin wall hole
4. Coefficient for correction of kinetic energy
5. The momentum equation. Force in a elbow pipe
6. Coefficient for correction of momentum

Lesson 3 HEAD LOOSES

1. Laminar and turbulent flow
2. General head losses: equation of Darcy-Weisbach
3. Head losses in laminar flow: Poiseuille's law
4. Head losses in turbulent flow. Experiences of Nikuradse.
5. Local head losses
6. Optimal diameter for a pipeline

Lesson 4 CENTRIFUGAL PUMPS

1. Classification of pumps
2. Centrifugal pumps. Euler equation
3. Head losses, power and yield of a pump
4. Characteristic performance. Working point
5. Cavitations. The NPSH concept
6. Examples of application

Lesson 5 OLEOHYDRAULICS

1. Classification of positive displacement machines
2. Theoretical, real and instantaneous flow
3. Energy yield
4. Basic schemas of hydrostatic transmission
5. Valves and servomechanisms
6. Examples of application

Bibliography

Recommended bibliography

Basic references

- J.Agüera Soriano, "Mecánica de fluidos incompresibles y turbomáquinas hidráulicas", 5ª ed., Editorial Ciencia3 S.A., 2002 (ISBN: 84-95391-01-05)
- Merle c. Potter, David C. Wiggert, "Mecánica de fluidos". Ed. Paraninfo Thomson Learning, 3ªed. 2002. (ISBN: 970-686-205-6)
- J.B.Franzini, E.J.Finnemore, "Mecànica de fluidos con aplicaciones en Ingenieria", 9ªed., McGraw-Hill, 1999, (ISBN: 84-481-2474-X)
- Claudio Mataix, "Mecánica de fluidos y máquinas hidráulicas", 2ª ed., Ediciones del Castillo S.A., Madrid 1986 (ISBN: 84-219-0175-3).
- Irving H. Shames, "Mecánica de fluidos", Ed. McGraw-Hill, 1995.

Additional references

- V.L. Streeter, E.Benjamin, K.W. Bedford, "Mecánica de los fluidos", Ed. McGraw-Hill, 9ª ed., 2000 (ISBN: 968-600-987-4).
- Frank M.White, "Fluid Mechanics", Ed. McGraw-Hill, 1986
- Robert L.Mott, "Mecánica de fluidos Aplicada" 4ªed. 1996. Ed. Prentice Hall. ISBN: 968-880-542-4
- B.R.Munson, "Fundamentos de Mecánica de Fluidos", 1999, Ed. Limusa, ISBN: 968-18-5042-4.
- Jordi Bosser, "Vademecum de mecánica de fluidos y máquinas hidráulicas", 1990, CPDA, ETSEIB, Publicacions

UPC.

-“Màquines hidràuliques i de fluids. Màquines volumètriques”, 1993, CPDA,ETSEIB, Publicacions UPC.

-M.V. Zubicaray, J.A. Fernández, “Bombas, teoría, diseño y aplicaciones” 3ª ed., Ed. Limusa, 2003. ISBN: 968-18-6443-3.