



Universitat de Lleida

DEGREE CURRICULUM  
**FLUIDS ENGINEERING**

Academic year 2013-14

## Subject's general information

<b>Subject name</b>	Fluids Engineering
<b>Code</b>	102302
<b>Semester</b>	2n Q Avaluació Continuada
<b>Typology</b>	Obligatòria
<b>ECTS credits</b>	6
<b>Theoretical credits</b>	0
<b>Practical credits</b>	0
<b>Department</b>	Informàtica i Enginyeria Industrial
<b>Important information on data processing</b>	Consult <a href="#">this link</a> for more information.
<b>Language</b>	Català
<b>Office and hour of attention</b>	Despatx 2.08 EPS en horari a convenir

Josep Illa

## Subject's extra information

### Suggestions

The present course is based on the concepts already exposed in Mechanics of Fluids and is intended to achieve the level of analysis commonly used in the practice of engineering design. The difficulty in the analysis of complex fluid systems forces the use of numerical computational techniques where the major handicap is the accurate design of the algorithms adapted to each problem type. Those algorithms will be implemented in Matlab. It is recommended for the student to refresh the concepts of Fluid Mechanics, Numerical Methods and Programming given in previous courses.

### The course as part of the academic plan

The fluids system engineering is a part of mechanics, considered as a whole discipline. With that background the present course will give a practical perspective integrating concepts both from Mechanics and from Fluid Mechanics. The course will take place during the second semester and is structured in 3cr theory, 2cr problems and 1cr practicum. In the individualized practicum specific problems will be proposed and the student will have to develop a strategy to solve and implement them in Matlab. Some basic references for the course are in english.

## Learning objectives

Veure apartat de competències.

## Competences

### Degree-specific competences

- Applied knowledge to thermal engineering

#### Goals

- Without Translate - Saber aplicar els conceptes de balanç de massa i energia a l'anàlisi de sistemes de fluids.

- Applied knowledge of the principles of hydraulic engineering systems and machines.

#### Goals

- Without Translate - Assolir una visió global dels principis de funcionament de de les màquines fluidomecàniques i de la seva integració en sistemes de xarxes o circuits de fluids.

### Degree-transversal competences

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

#### Goals

- Without Translate - Assolir la capacitat de plantejar hipòtesis simplificadores per la resolució de problemes i d'analitzar la sensibilitat dels resultats obtinguts respecte a les hipòtesis assumides.

- Ability to analyse and synthesize.

#### Goals

- Without Translate - Assolir la capacitat d'anàlisi de sistemes de fluids i de plantejar estratègies de resolució d'un problema determinat.

## Subject contents

### Chapter 1. BASIC PIPE CONFIGURATIONS

1. Series pipe configuration
2. Parallel pipe configuration
3. Characteristics of pumps in series and parallel
4. Working point
5. The three reservoir problem
6. Optimal diameter

### Chapter 2. PIPE NETWORK ANALYSIS

1. Types of networks
2. Analysis of manifold systems
3. Looped networks. Hardy-Cross method
4. Other computational methods for network analysis
5. Simulations and economical design

### Chapter 3. TRANSIENT FLOW

1. Incompressible transient flow in rigid pipes
2. Basic description of the water hammer. Practical calculations
3. Equations governing hydraulic transients
4. Numerical solutions. The characteristics method
5. Transients in networks

### Chapter 4. NON NEWTONIAN FLOWS

1. Classification and industrial use
2. Interaction between fluids and particles
3. Fluid transport with suspended particles
4. Rheological properties of fluids
5. Non newtonian pipe fluid flow

### Chapter 5. OLEOHYDRAULICS

1. Classification of positive displacement machines

2. Theoretical, real and instant flow
3. Efficiency
4. Schemes of hydrostatic transmissions
5. Valves and servomechanisms

## 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)
- Claudio Mataix, "Mecánica de fluidos y máquinas hidráulicas", 2ª ed., Ediciones del Castillo S.A., Madrid 1986 (ISBN: 84-219-0175-3).
- V.L. Streeter, E.Benjamin, K.W. Bedford, "Mecánica de los fluidos", Ed. McGraw-Hill, 9ª ed., 2000 (ISBN: 968-600-987-4).
- Irving H. Shames, "Mecánica de fluidos", Ed. McGraw-Hill, 1995

### Advanced references:

- Bruce E. Larock, Roland W. Jeppson, "Hydraulics of pipelines systems". Ed. CRC Press. 2000 (ISBN: 0-8493-1806-8).
- R.P.King, "Introduction to practical fluid flow" Ed. Butterworth-Heinemann 2002 (ISBN: 0-7506-4885-6).
- Frank M.White, "Fluid Mechanics", Ed. McGraw-Hill, 1986