Universitat de Lleida

DEGREE CURRICULUM

THERMODYNAMIC ENGINEERING 2

Academic year 2013-14

THERMAL ENGINEERING II 2013-14

Subject's general information

Subject name	Thermodynamic engineering 2
Code	102301
Semester	First quarter
Typology	Compulsory
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.
Language	Catalan 90% English 10%
Distribution of credits	Dr. Ingrid Martorell Boada (3.6) Dr. Gabriel Zsembinszki (2) Dr. Laia Miro Toran (4)
Office and hour of attention	Set up with the teacher

THERMAL ENGINEERING II 2013-14

Dr. Ingrid Martorell Boada RESPONSIBLE TEACHER
Dr. Gabriel Zsembinszki
Laia Miro Toran

Learning objectives

Veure apartat de competències.

Competences

Degree-specific competences

- Applied knowledge to thermal engineering

  Goals

  - - Learn the knowledge associate with thermal energy - Solve problems of thermodynamics - Analyze problems and their solutions critically

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

  Goals

  - - Learn knowledge associate with fluidomechanics - Solve problems - Analize problems and their solutions critically - Search data to solve problems

Degree-transversal competences

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

  Goals

  - - Solve problems - Discuss results

- Ability to analyse and synthesize.

  Goals

  - - Be able to analize and synthesize concepts learned in the course

Subject contents

First. Properties of pure substances

01.01. Pure substances

02.01. Phases of a pure substance

03.01. Change processes do a pure substance

01.04. Property diagrams for phase change processes

05.01. Property tables

01.06. Ideal gas equation of state

07.01. The compressibility factor - a measure of the deviation from ideal gas

THERMAL ENGINEERING II 2013-14

01.08. Specific heat

09.01. Internal energy, enthalpy and specific heat of ideal gases

1.10. Internal energy, enthalpy and specific heat of solids and liquids

1.11. Problem properties pure substances

Two. First law of thermodynamics

02.01. The first principle of thermodynamics

02.02. Energy balance for closed systems

2-3. Energy balance for steady state systems

02.04. Some stationary equipment engineering

05.02. Energy balance for non-steady state processes

02.06. Problems first principle of thermodynamics

Three. Second law of thermodynamics

03.01. Introduction to the second law of thermodynamics

03.02. Thermal energy storage

03.03. Heat engines

03.04. Efficiencies in energy conversion

03.05. Refrigerators and heat pumps

06.03. The Carnot cycle

07.03. The Carnot heat engine

08.03. The refrigerator and heat pump Carnot

09.03. Problems of the second law of thermodynamics

Four. Entropy

01.04. Entropy

02.04. The principle of entropy increase

03.04. Entropy change of pure substances

04.04. Isentropic processes

04.05. Entropy change of liquids and solids

04.06. Entropy change of ideal gases

07.04. Isentropic efficiency of steady state devices

08.04. Balance of entropy

09.04. Problems entropy

5. Gas power cycles

05.01. Cosideracions basic analysis of power cycles

05.02. Carnot cycle and its value engineering

03.05. Standard air assumptions

04.05. Reciprocal motor

05.05. The Otto cycle: the ideal cycle for spark-ignition engines

06.05. Diesel Cycle: The Ideal Cycle for Compression-ignition engines

07.05. Stirling and Ericsson cycles

08.05. Brayton cycle: the ideal cycle for gas turbines

05.09. Problems cycle gas power

6. Steam power cycles and combined cycles

01.06. Carnot cycle steam

02.06. The Rankine cycle: the ideal cycle steam power cycles

06.03. Deviations of actual vapor power cycles ideals

Methodology

The methodology of the course will be divided into:

1.-Theoretical sessions where the teacher will present the theory necessary for the acquisition of knowledge.

2.-Problems sessions where teacher will present some examples but basically students will play an active role in the learning process working in small groups or individually.

3.-practical laboratory sessions where students work in group.

Development plan

El pla de desenvolupament seguirà l'ordre dels continguts i intercal·larà una sessió de teoria amb una altra de problemes.

Week	Day	Content	Teacher
1	16 SET	Course presentation	Ingrid/Laia/Gabriel Z
	20 SET	Problems	Gabriel Z
2	23 SET	Theory	Ingrid

	27 SET	HOLIDAY	
3	30 SET	HOLIDAY	
	4 OCT	Problems	Gabriel Z
4	7 OCT	Theory	Ingrid
	11 OCT	Problems	Gabriel Z
5	14 OCT	Theory	Ingrid
	18 OCT	Problems	Laia
6	21 OCT	Theory	Ingrid
	25 OCT	EES Sessions	Gabriel Z
7	28 OCT	Theory	Ingrid
	1 NOV	HOLIDAY	
8	4 NOV	Theory	Ingrid
	6 NOV	Problems	Laia
9	11-15 NOV	FIRST PARTIAL	
10	18 NOV	Theory	Ingrid
	22 NOV	Problems	Laia
11	25 NOV	Theory	Ingrid
	29 NOV	lab sessions	Laia/Ingrid
12	2 DES	Theory	Ingrid
	6 DES	HOLIDAY	
13	9 DES	Theory	Ingrid
	13 DES	Problems	Laia
14	16 DES	Theory	Ingrid
	20 DES	Problems	Laia
	21 DES A 6 GENER	CHRISTMAS	
15	10 GEN	ProbleMs	Laia
16/17	13-24 GEN	SECOND PARTIAL	

Evaluation

EVALUATION ACTIVITY 1: FIRST PARTIAL

–30%

–Score ≥ 3

EVALUATION ACTIVITY 2: SECOND PARTIAL

–50%

–Score ≥ 3

EVALUATION ACTIVITY 3: LAB AND EES SESSIONS

–20%

–iN GROUP

–Score ≥ 4 (all practices average)

Bibliography

-Yunus A. Çengel, Michael A. Boles "Thermodynamics, an engineering approach", International Edition, Fourth Edition, Mc Graw Hill, ISBN: 0-07-238332-1