DEGREE CURRICULUM

THERMAL ENGINEERING II

Academic year 2015-16

THERMAL ENGINEERING II 2015-16

Subject's general information

Subject name	THERMAL ENGINEERING II
Code	102301
Semester	First quarter
Typology	Compulsory
ECTS credits	10.2
Theoretical credits	3
Practical credits	7.2
Office and hour of attention	Set up with the teacher
Department	Informàtica i Enginyeria Industrial
Modality	Presencial
Important information on data processing	Consult this link for more information.
Language	Catalan 100%
Degree	Degree in Mechanical Engineering
Distribution of credits	Dr. Ingrid Martorell Boada Laia Miró Torán Aran Solé Garrigós
Office and hour of attention	Set up with the teacher
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THERMAL ENGINEERING II 2015-16

Dr. Ingrid Martorell Boada (RESPONSIBLE TEACHER)
Laia Miró Torán
Aran Solé Garrigós

Learning objectives

Problem resolution: Ability to solve problems numerically and be able to elaborate and discuss the obtained results using the critical thinking.

To be able to analize from a critical point of view and be able to sintezise the concepts learnt

To learn the thermal energy concepts: The student has to show that is able to learn theoretical and practical knowledgments.

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

Competences

EPS1. Capacity to solve problems and prepare and defence arguments inside the area of studies.

EPS6. Capacity of analysis and synthesis.

GEM21. Applied knowledge of thermal engineering.

GEM24. Applied knowledge of the basics of fluidomechanic machinery.

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

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

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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

Week	Day	Content
1	14 SEP	Presentation Chapter 1-Properties of pure substances.
	18 SEP	Problems chapter 1
2	21 SEP	Chapter 1-Properties of pure substances. Chapter 2- The first principle of thermodynamics
	25 SEP	Problems chapter 1
3	28 SEP	HOLIDAY UDL
	2 OCT	Problems chapter 2
4	5 OCT	Chapter 2- The first principle of thermodynamics
	9 OCT	Problems chapter 2

5	12 OCT	HOLIDAY
	16 OCT	LABORATORY
6	19 OCT	Chapter 3- The second principle of thermodynamics
	23 OCT	Problems chapter 3
7	26 OCT	Chapter 3- The second principle of thermodynamics
	30 OCT	Problems chapter 3
8	2 NOV	Chapter 3- The second principle of thermodynamics
	6 NOV	Problems chapter 3
9	9-13 NOV	FIRST EXAM
10	16 NOV	Chapter 4- Entropy
	20 NOV	Problems chapter 4
11	23 NOV	Chapter 4- Entropy
	27 NOV	Problems chapter 4
12	30 NOV	Chapter 5- Gas power cycles
	4 DEC	Problems chapter 5
13	7 DEC	Chapter 5- Gas power cycles
	11 DEC	Problems chapter 5
14	14 DEC	Chapter 6- Steam power cycles
	18 DEC	LABORATORY
15	21 DEC	Chapter 6- Steam power cycles
	23 DEC -6 JAN	CHRISTMAS HOLIDAYS
15	8 JAN	Problems chapter 5
16/17	11-22 JAN	EXAMS

Evaluation

EVALUATION ACTIVITY 1: FIRST PARTIAL

–30%

–Score ≥ 3 to average with the other scores of the course

-With a score below 3.0 the student cannot do the second partial and goes directly to the final exam.

EVALUATION ACTIVITY 2: SECOND PARTIAL

–40%

–Score ≥ 3 to average with the other scores of the course.

EVALUATION ACTIVITY 3: LAB ACTIVITIES- In group activities

–20%

–iN GROUP

–Score ≥ 4 (all practices average)

-Two activities: a written memory of the lab activities and a written test solved in groups that will take place the same day of the lab.

EVALUATION ACTIVITY 4: LAB ACTIVITY- Individual

–10%

–Score ≥ 3

-One individual written test to be answered in the lab

Bibliography

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