Universitat de Lleida

DEGREE CURRICULUM

SERVICES II

Academic year 2015-16

ENERGY FACILITIES II 2015-16

Subject's general information

Subject name	SERVICES II
Code	102312
Semester	2n Q Continuous evaluation
Typology	Non-compulsory
ECTS credits	6
Theoretical credits	50
Practical credits	50
Office and hour of attention	To contact the teacher to set up an appointment
Department	Computer and Industrial Engineering department
Modality	Presencial
Important information on data processing	Consult this link for more information.
Degree	Degree in Mechanical Engineering
Distribution of credits	Dr Ingrid Martorell
Office and hour of attention	To contact the teacher to set up an appointment
E-mail addresses	Dra Ingrid Martorell i Boada (imartore@diei.udl.cat)

ENERGY FACILITIES II 2015-16

Dra Ingrid Martorell i Boada

Learning objectives

To show good english level in both regular classes and evaluation activities. To write a report in English regarding a scientific paper in English related with the contents of the course.

To show learning skills needed to access to a master or other superior studies.

To work in group in both regular classes and evaluation activities.

To perform climatization installation calculus.

To study systems of generation of energy such as combustion, conventional energies (nuclear, fossil fuels,....) as well as more complex systems such as cogeneration ones.

To demonstrate good skills and critical thinking when analyzing energetic systems.

Competences

UdL2 Command of a foreign language.

EPS4. To have the skills required to undertake new studies or improve the training with self-direction.

EPS9. Capacity for unidisciplinary and multidisciplinary teamwork.

GEM-EPS31. Capacity to design HVAC installations (heating, ventilation and air conditioning).

GEM-EPS32. Applied knowledge to distributed energy generation and energy use.

GEM-EPS33. Capacity of analysis of energy systems, optimization and integration
of them and reduction of the environmental burden.

Subject contents

1.- COMBUSTION

-COMBUSTION MECHANISMS

-BURNERS

2.- REFRIGERATION

-COMPRESSION SYSTEMS

-ABSORPTION SYSTEMS

3.-CONVENTIONAL ENERGIES

-FOSSIL FUELS

-NATURAL GAS

-OIL

-NUCLEAR ENERGY

4.- COGENERATION

-ADVANTAGES AND DISADVANTAGES

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-ENERGY SAVING

-THERMODYNAMICS: VAPOR TURBINS, GAS, COMBINED CYCLES, ALTERNATIVE MOTORS

5.- TURBINES AND HEAT ENGINES

-BASIC CYCLE STEAM TURBINES

–Introduction

–Carnot cycle with steam vapor

–Rankine cycle with steam vapor

–Improvement on the Rankine cycle

–Energetic balance in a real cycle

-BASIC CICLE OF GAS TURBINES

–Introduction

–Ideal Brayton cycle

–Real Brayton cycle

-ENERGY LOSSES, EFFICIENCY AND POWER OF TURBINES AND THERMAL ENGINES

–Introduction

–Internal losses

–External losses

–Energy efficiency

Methodology

The methodology of this course will consist of:

1.-Theoretical session where the theacher expose the theoretical concepts required for students' proper knowledge and for the right performance in the practical sessions.

2.-Practical sessions where students will play an active rol and will work in group or individually.

Development plan

Week	Day	Content
1	8 FEB	Presentation
	10 FEB	Combustion

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2	15 FEB	Combustion
	17 FEB	Combustion
3	22 FEB	Compression refrigeration
	24 FEB	Cancelled. Class wil l be on the "5th Feb: VISIT to Hybrid powerplant i Les Borges
4	29 FEB	Compression refrigeration Paper selection (email)
	2 MARCH	Compression refrigeration
5	7 MARCH	Compression refrigeration /Lab groups deadline
	9 MARCH	Absorption refrigeration
6	14 MARCH	Absorption refrigeration
	16 MARCH	Absorption refrigeration
7	21-28 MARCH	HOLIDAYS
	30 MARCH	Conventional energies
8	4 APRIL	Lab activities

	6 APRIL	Conventional energies / review
9	11-15 APR	EXAMS: First partial

Week	Day	Content
10	18 APRIL	Cogeneration
	20 APRIL	Cogeneration
11	25 APRIL	Cogeneration
	27 APRIL	Turbines
12	2 MAY	Turbines
	4 MAY	Heat engines
13	9 MAY	lab report deadline/ Heat engines
	11 MAY	Holiday
14	16 MAY	HEat engines
	18 MAY	evaluation: individual project
15	23 MAY	Heat engines
	25 MAY	Heat engines
16/17	30-10 JUNE	Exams

Evaluation

-FIRST PARTIAL: 35%

-SECOND PARTIAL: 35%

-SCIENTIFIC PAPER: INDIVIDUAL TEST: 15%

-LAB AND IN-CLASS PRACTICES: 15 %

Bibliography

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- Bejan, ‘Thermal Design Optimization’, 1996. Ed. John Wiley & Sons, Inc. ISBN: 0-471-58467-3.
- R.F. Boehm, ‘Developments in the Design of Thermal Systems’, 1997, Ed. Cambridge University Press. ISBN: 0-521-46204-5.
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- Y. A. Çengel, M. A. Boles, “Thermodynamics”, McGrawHill, 2002. ISBN: 0-07-112177-3.