Centre	**University College of Engineering of Vitoria-Gasteiz**
Name of subject	**26044 – Thermal Systems and Machines**
Qualification	**Degree in Mechanical Engineering**
Type	**Compulsory**
Credits	**6 ECTS**
Year	**3**
Term(s)	**2nd**
Department	**Thermal Machines and Heat Engines**
Language	**Spanish and Basque**

Outcomes / Objectives

Thermal power and refrigeration systems. Thermal systems in construction and industry. Facility analysis and design.

Syllabus

Power gas and vapour power cycle extension. Advanced power cycles applied to thermal power plants and cogeneration plants.

Refrigeration cycle extension. Innovations of refrigeration cycles, absorption and gas cycles. Heat pumps used in renewable energies: geothermal, solar, biomass boilers,...

Heating systems. General study of the design and calculation of heating systems.

Air conditioning systems. General study of the design and calculation of air conditioning and ventilation systems.

Industrial systems. Application to the design of systems for industrial buildings.

Solar thermal energy systems. Harnessing solar energy to power hot water systems and low temperature systems. Absorption refrigerators. Solar thermal power stations.

Shallow and deep geothermal systems. Harnessing geothermal energy to power heating systems. Advanced electricity generation systems.

Biomass systems. Study of thermal devices for harnessing biomass energy.

Projects, energy audits and inspections. Thermal project analysis and applicable legislation. Energy audits and systems inspection. Integrated thermal engineering project management.

Methodology

Teaching Method

Face-to-Face Teaching Hours								
Lectures	**Seminars**	**Classroom practice**	**Lab. practice**	**Computer sessions**	**Clinical practice**	**Workshops**	**Industrial workshops**	**Field practice**
36		9		15				
Student Hours of Non Face-To-Face Activities								
Lectures	**Seminars**	**Classroom practice**	**Lab. practice**	**Computer sessions**	**Clinical practice**	**Workshops**	**Industrial workshops**	**Field practice**
54		12		24				

Assessment System

General criteria

→ Written essay exam
→ Practical tasks (exercises, case studies or problems)
→ Group assignments
→ Presentation of assignments, reading...

Compulsory materials

- Properties tables.
- EES programme
- Psicro + Aislam programmes
- Cerma programme

Bibliography

Basic Bibliography

- Termodinámica - Cengel 5ª ed.
- Fundamentos de Ingeniería Termodinámica - Moran – Shapiro
- Ingeniaritza -termodinamikaren oinarriak - Moran – Shapiro
- Transferencia de Calor y Masa: Cengel, 3ª ed.
- RITE
- CTE
- Calefacción - Miranda - Editorial Ceac
- Aire Acondicionado - Miranda - Editorial Ceac

In-depth Bibliography

- ASHRAE: Fundamentals