

Processes & energy



ECTS
5 credits



Component
INSTITUT
NATIONAL
DES SCIENCES
APPLIQUEES
TOULOUSE



Number of
hours
42h

Presentation

Description

Programme (detailed contents):

- the global context of production and processing energy
- processes for power generation,
- renewable energies : wind, solar and biogas,
- steam power cycles: Carnot cycle with superheat, reheat and withdrawals (cycle with maximum theoretical efficiency). Application to nuclear plants. Cogeneration systems. Size and optimization of the plant (energy and exergy efficiency)
- refrigeration cycles from reverse Carnot cycle without change of state to the real cycle of refrigerating machines with change of state.
- the absorption chillers. Size and optimization of the plant (energy and exergy efficiency)
- the gas liquefaction. Cycle at maximum theoretical efficiency, Linde and Claude cycles. Presentation facilities for liquefying air and separating components. Special facilities for hydrogen and helium.

Organisation:

Lectures, tutorials and lab work. This module includes visiting of: a wind farm, a nuclear power plant (Golfech) and a landfill site (Montech)

Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):

- the world context of power-generating systems, which produces a net power output from a fossil, nuclear or renewable energy source.
- the legal and technical context of the various forms of renewable energy (wind, solar photovoltaic, biomass ...),
- the different thermodynamic cycles associated to the power generation systems, the refrigeration and heat pump systems and the gas liquefaction.
- the use of energy and exergy balances for these thermodynamic systems in order to optimize their operation

The student will be able to:

- design a given steam power plant, including the choice of working fluid temperatures, pressures and the determination of fluid working flows plus the pre-sizing of compressors and turbines

- design a refrigeration system, including the choice of working fluid temperatures, pressures and the determination of fluid working flows plus the preliminary design of compressors and expansion devices,
- design a gas liquefaction plant
- participate in the implementation of a wind energy area development and a site photovoltaic,
- participate in the implementation of a biogas network.

Pre-requisites

Thermodynamics.

Useful info

Place

> Toulouse