

PR4300

Cogeneration and Energy Production

Professor: Tanguy Poline

Language of instruction: English* – **Number of hours:** 36 – **ECTS:** 3

Prerequisites: General basic knowledge in physic (mechanics, thermodynamics,...)

Period: S8 Elective 10 February to June IN28IE3, SEP8IE3

Course Objectives

1/ Acquire general knowledge on energy production and consumption.

2/ Cogeneration/electricity plant:

- ✧ develop a project analysis (equipment, design, economic profitability)
- ✧ gain experience in operations (troubleshooting, control philosophy, environment)

3/ Be able, on a wide variety of energy related subjects (resources, technologies, processes, equipments, consumers), to perform a quick qualitative and numerical analysis.

On completion of the course, students should be able to

- ✧ Gain interdisciplinary knowledge in energy, and especially in cogeneration
- ✧ Quantify and perform a rough check of energy data in interdisciplinary areas

Course Contents

Cogeneration:

- ✧ Cogeneration principles, energy resources, specific costs.
- ✧ Basic cogeneration components: steam turbine, gas turbine, boiler, engine. Comparison.
- ✧ Heat recovery steam generator design. Technical details on the gas turbine.
- ✧ Plant operation: control philosophy, troubleshooting, costs, water management, environmental constraints.
- ✧ Potential visit in Rotterdam of industrial plants over one full day

Energy production and consumption:

- ✧ Presentation of main energy process lines with CO₂ (coal, liquid fuel, natural gas, bituminous).
- ✧ Partial presentation of main energy process lines without CO₂ (nuclear, hydraulic, wind, solar, bio, geothermal).
- ✧ Electricity and gas market.
- ✧ Sustainable development: classification of energy savings (electricity, industry, housing, transport).

Course Organization

Tutorials: 30 hr + one day visit + exam

Teaching Material and Textbooks

Handout electronic associated pdf

Evaluation

1/3: oral presentation

2/3: final exam (MCQ + exercices) over 2h30.