ENERGIE STOCKAGE-CONVERSION

ENERGY, STORAGE, CONVERSION

Lecturers: Jean-Pierre CLOAREC

| Lecturers : 16.0 | TC : 0.0 | PW : 0.0 | Autonomy : 0.0 | Study : 12.0 | Project : 0.0 | Language : FR

Objectives

This course is a synthesis of all the physical phenomena used for energy storage and conversion. For every 2 hours lecture, a specialist from ECL presents the fundamental phenomena of a field: batteries, thermal solar, solar photovoltaic, electromechanical conversion, energy and radiation, combustion, bioenergy. Matter stores energy in various forms. Energy density, capacity to store and dispense energy depends on the nature of the energy conversion implemented: weak, nuclear, electromagnetic, gravitation... The cycles and transformation processes allowing the conversions and exchanges of energy will be studied emphasizing the engineering linked to the particularly renewable energies (solar, wind, biomass). This course provides a better vision of the

Keywords : energy; renewables; energy density; transformation processes; energy conversion and exchange; storage techniques; solar; batteries; nuclear; wind; gravity; radiation;

Programme

-Synthesis on the different forms of energy and the associated orders of magnitude of energy density in matter
-solar; batteries and electrochemical storage; electromechanical conversion; electromagnetic conversion; combustion; bio-energy

Learning outcomes

- Systemic approach: model an energy system based on several disciplines, identifying the couplings between disciplines.
- Systemic approach: argue and discuss the choices made to design a complete energy system. Question the relevance of the validation criteria.
- Implement positive interactions within the mini-project team
- Carry out a state-of-the-art study on an open problem on technical-scientific-economic issues related to an energy need. Formalize the outcome. Demonstrate a broad vision taking into account technological, economic, human and environmental issues.

Independent study

Objectifs : Mobilize the concepts discussed in class and engineering sciences on concrete cases with scientific, technical and economic issues.
Practice dimensioning of renewable energy systems.

Méhodes : Group work on case studies chosen by students among a list or possibily proposed by students

Core texts

Roger Balian, *LES MULTIPLES VISAGES DE L'ÉNERGIE*, Ecole d'été de Physique sur l'énergie , 2001
CEA (ouvrage collectif) *MEMENTO SUR L'ÉNERGIE « ENERGY HANDBOOK »*, CEA, 2015

Assessment

Mark=50% knowledge + 50% know-how