Cross-cutting energy concepts: transport, conversion, storage and electrical energy

ECTS credits
2 credits

In brief

Course langage: French

Presentation

Learning objectives

- Present the various cross-cutting aspects such as the different forms of energy conversion, energy transport, consumption and Smart grids
- Master the basic elements of the conversion of primary energy into electrical energy through transport, storage, consumption and Smart grids
- Understand the operating principle of electrical machines in motor and generator operation Present the main topologies of power electronic converters that allow to supply an electrical equipment (engine, alternator, electronic board...) from a given energy source (AC network, battery...)
- Present the different means of storing electrical energy and the technical and economic stakes for the future

Description of the programme

- Conversion of electrical energy into mechanical energy (electric motors): synchronous motor, asynchronous motor, operating principle, modeling, equivalent diagram, torque calculation
- Conversion of mechanical energy into electrical energy (electrical generators, wind turbines): asynchronous and synchronous generator (alternator)
- Conversion of electrical energy into electrical energy: sources, switches, connection rules, switching cell, family of static converters (AC/DC, DC/DC, DC/AC, principles, advantages and disadvantages of structures, three-phase transformer)
- Transport of electrical energy
- Use of electrical energy (rail traction, transportation [land, air, sea], industrial processes, pumping, household appliances, lighting, buildings...)
- Storage of electrical energy (chemical accumulators, fuel cells, super capacitors, flywheels, etc.)

- Presentation of Smart Grids, which allow to couple different forms of localized (power plant) or distributed (photovoltaic panels or others) energies on a distribution network; and to supply a complex typology of consumption modes (residential, industrial, tertiary...)

Generic central skills and knowledge targeted in the discipline

C1: Central engineers create value through scientific and technical innovation.
C2: Central engineers master the complexity of the systems and problems they encounter.
C3: Central engineers manage programs.
C4: Central campus engineers manage in an ethical and responsible manner.

How knowledge is tested

Supervised homework

Bibliography

Course handout

Teaching team

- Mohamed Boussak
- Thierry Gaidon

Total des heures		**20h**
CM	Master class	20h

Useful info

Name responsible for EU

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