



Science & engineering program offered at ECAM Lyon Summer School 2012

Short conferences and original practical courses on the theme of the conversion of energy: solar cell, fuel cell energy, wind energy, nuclear reactor PWR, electrical grid, electrical to mechanical and reverse by electric motors. Case studies and personal work on these themes.

Number of sessions (3hrs)

- 1) ***Nuclear power plant and power grid*** **2**
 - Operating principle of a nuclear reactor, fission chain reaction, schematic diagram of a nuclear power plant with electro-mechanic-thermal conversion, performances. Three-phase and one-phase power grid, currents and power calculation. Electrical test with a transformer and some receivers.

- 2) ***Electro-mechanical conversion*** **3**
 - Operating principle of direct-current and induction motors, calculation rules, applications examples.
 - Manipulation on test benches, performance measurement.
 - Settings of the motor speed and/or motor speed and torque control with electronic speed controller.
 - Tests of a high performance brushless servomotor.

- 3) ***Photovoltaic conversion*** **1**
 - Operating principle of a photovoltaic cell, main characteristics, performance of a solar panel installation, application examples.
 - Test bench with a solar panel, DC-DC converter and reserve capacity.
 - Simulation software to study the behavior with or without coupling network.

- 4) ***Wind turbine energy*** **1**
 - Operating principle of a wind turbine, main characteristics, conversion of mechanical energy to electrical energy with or without coupling network, with synchronous or induction generator, schemes of associated electronic convertor, installation examples.
 - Test bench of the coupling network of a synchronous alternator.

- 5) **Fuel cell** **1**
- Operating principle of a fuel cell, main characteristics, performance, hydrogen generation and stocking means, applications examples (electric vehicle,...)
 - Test bench of a 500W fuel cell, DC-DC converter, supercapacitor used with a small electric engine.

- 6) **Control system** **1**
- Presentation of an industrial programmable logic controller PLC, performances and industrial applications.
 - Test bench of a device with on-off inputs and outputs and of a small process control, small controller programming and analysis of the system response.

Project **4**

Bibliography project about one of the conferences subject
Two follow-up stages

Assessment **20 mn + 2 h**

Oral presentation of the project + questions
Multiple-choice questionnaire about conferences and practical courses