



ST5 – 59 – ASSISTANCE AND AUTONOMY OF THE PERSON

Dominante : VSE (Living-Health-Environment) and ENE (Energy)

Langue d'enseignement : French

Campus où le cours est proposé : Metz

Engineering problem

This thematic sequence deals with the design of motorized assistance systems for people with reduced mobility, whatever their nature, in its technical, economic and ergonomic aspects. This issue, which has a strong societal impact, is at the heart of two concerns. Firstly, the ageing of the population is increasing the need for this type of system. In addition, due to the evolution of low-cost on-board computer systems, it is now possible to offer increasingly complex functionalities, allowing the spectrum of services provided to be broadened, ranging from motor servoing to more advanced control (trajectory calculation, obstacle avoidance) or even connected and communicating systems.

For example, a very common device nowadays is the wheelchair to help people with reduced mobility (paralysis of the legs). These chairs can be simply mechanical or electrically assisted. Reimbursed by the social security, they are medical devices subject to approval.

Beyond the technical problems, one must also consider the cost (in France the price is fixed by the social security) and the ergonomics. Experiments are taking place on systems that could be different, such as exoskeletons.

Advised prerequisites

None

Context and issue modules: this part is structured in conferences and round table allowing to apprehend the problematic, the technologies and the stakes of the devices related to the person:

- Environment, type of pathology, manual and electric wheelchairs. Homologation
- How to improve people's lives
- Demonstration of wheelchairs, technological locks, innovation

Specific course (60 HEE): *Control of a motorization chain*

Short description : This course deals with the notions necessary for the control of a motorization chain in its electronic aspects (converters, power,



supply), servo control (modeling, observers, regulators) and digital (analog-digital conversion, programming, real time). The practical aspects will be tested on microcontroller boards in order to implement a speed control system for a DC motor.

Challenge Week : *Design of a motorized wheelchair for people with reduced mobility*

Associated partner: Logosilver Company, CERAH (Center for Study and Research on the Fitting of the Handicapped)

- **Location:** Metz campus

- **Brief description :** A wheelchair for a person with reduced mobility must ensure a minimum level of safety set by standards. Mechanical design and motor control work together to achieve this safety. The confrontation of the students with the normative and security aspects at the same time as with the mechanical and electronic/computer technical aspects opens them to the multidisciplinary dimension. The specificity of this integration course is the consideration of safety in technical designs. In addition, as current trends are for all objects to be increasingly "connected", functions of this type will be considered (steering the chair from a smartphone, steering the house from the chair, etc.).

This integration course is designed to lead to the concrete realization of a wheelchair. The whole is a mini-project sequenced in individual thematic sessions (mechanics, electronics, computer science, automation...). The themes can be variable according to the groups of students (not all groups do all the themes) and will follow a schedule allowing to arrive at the end at an operational chair.