

M24 – PARIS-SACLAY

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Switched Systems and Control



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Abstract of the course:

Switched systems are dynamical systems described by a family of continuous-time systems and a rule that orchestrates the switching between them. Such systems are interesting objects for theoretical study and provide realistic models suitable for many applications.

This course will examine switched systems from a control-theoretic perspective. The main focus will be on stability analysis and control synthesis of systems that combine continuous dynamics with switching events. In the analysis part of the course, we will develop stability theory for switched systems; properties beyond traditional stability, such as invertibility and input-to-state stability, will also be discussed. In the synthesis part, we will investigate several important classes of control problems for which the logic-based switching paradigm emerges as a natural solution.

Topics include:

- Single and multiple Lyapunov functions
- Stability criteria based on commutation relations
- Stability under slow switching
- Switched systems with inputs and outputs
- Control of nonholonomic systems
- Quantized feedback control
- Switching adaptive control

