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## 2SC5894 – Design and analysis of production systems for smart factories

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**Instructors:** Paolo Ballarini

**Department:** DOMINANTE - INFORMATIQUE ET NUMÉRIQUE

**Language of instruction:** FRANCAIS

**Campus:** CAMPUS DE PARIS - SACLAY

**Workload (HEE):** 40

**On-site hours (HPE):** 27,00

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### Description

Recent developments in manufacturing engineering lead to the formulation of dedicated new paradigms such as Industry 4.0 (Germany) and smart manufacturing (USA). The main idea behind these novel paradigms is that future production systems shall be capable to fulfill individual customer requirements by flexibly adapting the production outcome so to yield product variants in very small lot size. To this aim manufacturing systems must become "smart" hence consisting of intelligent machines, pieces and infrastructures able to exchange and process information so that the production process adapts itself to the specific customer requirements. In this context modelling and performance analysis of production processes becomes fundamental. In this course we are going to focus on formal modelling and performance analysis of production processes whereby a number of fault-prone machines are arranged in a given topology to yield a given final product. We are going to analyse how relevant performance indicators are affected by different aspects of the production systems and so to study the impact that system's (re)configuration has on productivity.

### Quarter number

ST5

### Prerequisites (in terms of CS courses)

Students must have attended the course "Systèmes critiques" of ST5

### Grading

Seminar

### Resources

A tutorial room with WiFi connection



### **Learning outcomes covered on the course**

Students will learn how to apply formal methods to the problem of modelling and performance analysis of a production system, i.e. a system composed by a network of fault-affected, repairable manufacturing machines that can be configured adaptably in response to market needs.

- developing stochastic models of production systems starting from a informal specifications
- taking into account fault injections in the production system model
- conception of relevant key performance indicators for analysing the performances of the production system (fault tolerance, availability, throughput, etc)
- execution of a complete performance analysis study based on model checking approaches

### **Description of the skills acquired at the end of the course**

see "learning outcomes"