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## 2SC6310 – System Architecture and Modeling

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**Instructors:** Herve Gueguen, Nabil Sadou

**Department:** CAMPUS DE RENNES

**Language of instruction:**

**Campus:** CAMPUS DE RENNES

**Workload (HEE):** 60

**On-site hours (HPE):** 34,50

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### Description

Modern systems are becoming more and more complex. This complexity results from the interaction between their components, the increase and complexity of the exchanged data, the heterogeneity of concepts, substances, trades, standards, but also from human complexity (organization, ergonomics, psychology, sociology ...).

To better handle this complexity, it is often necessary to model the different artifacts of the system. This modeling allows stakeholders at different phases of the system's life to better understand its objectives, to structure its architecture, to make analyses to predict its behavior, and thus to make a justified choice between alternatives. The various models constitute a reference for all stakeholders involved in the system design. Thus, the objective of this course is to provide students techniques and tools for modeling and structuring system architectures. Technological systems will be privileged with fields such as avionics, railway, industry, energy, or health. Moreover, the emphasis will be made in identifying system performance attributes (critical SPI system performance indicators) that need to be monitored to design, implement, operate, or manage complex systems.

### Quarter number

ST5

### Prerequisites (in terms of CS courses)

none

### Syllabus

1. Introduction to system modeling
2. Stakeholders' needs and requirements modeling
3. System architecture structuring and modeling
4. Behavioral modeling and composition
5. Choice of structure
6. Technical solutions modeling and trade-off



### **Class components (lecture, labs, etc.)**

The courses are in French with specific modalities to allow the adaptation of students with a low level in French: all the materials are in English, the tutorials, the project are provided in English. English specific sessions are also scheduled.

### **Grading**

written exam (1h) (30%) and regular testing (70%)

### **Resources**

lectures, exercises, case study

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

By the end of this course, students will be able to :

- Design and implement system modeling (Observe, Define the system, Propose a formal model, Analyze and Exploit the results)
- Understand the concepts of system structure (components, hierarchies, and decomposition principles) with a particular focus on the interactions between the elements of a system (causal or non-causal, synchronous, or asynchronous, information or energy exchange interfaces, etc.).
- Understand and analyze interactions to accurately organize the architecture of a system to facilitate its modularity and future evolutions.
- Deploying the various techniques of behavioral modeling of a system to predict its behavior.

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

- C1.1 Examine a problem in full breadth and depth, within and beyond its immediate parameters, thus understanding it as a whole. This whole weaves the scientific, economic, and social dimensions of the problem.
  - C1.1 Study a problem as a whole, the situation as a whole. Identify, formulate and analyze a problem in its scientific, economic and human dimensions
  - C1.2 Select, use, and develop modeling scales, allowing for appropriate simplifying hypotheses to be formulated and applied towards tackling a problem.
- C8 Leading a project, a team
  - a. C8.1 Work collaboratively in a team.