

# CURS MÀSTER IN COMPUTING

Dates: Monday 14th June, 10-12  
Tuesday 15th June 10-13  
Wednesday 16th June 10-12  
Thursday 17th June 10-13

Room: S2 S215, building Omega

## Software engineering for adaptive and evolvable systems

Instructor:

**Carlo Ghezzi**  
Politecnico di Milano, Italy

Description: Software evolution has been both an opportunity and a challenge since many years. Through continuous evolution, in fact, software systems can cope with changes in the requirements arising in the business world. But software evolution does not come for free. It requires suitable support methods and technologies. Recently, however, the nature and goals of evolution became more radical. Software increasingly lives in an open world that changes dynamically, and must respond to these changes by adapting its behavior in a self-managed manner. Notable examples of this situation are ubiquitous systems, whose functionalities are largely context-dependent. Service-oriented computing is another notable example. It is expected that in the future the network will make available a huge number of services that will be exposed for use through standardized protocols. Applications will be built by dynamically searching and composing services. The course explores the main issues and challenges that adaptive and evolvable systems raise to software engineering and illustrates some of the promising approaches that are investigated by current research.

Course outline:

1. Historical perspective of software evolution  
From the closed-world assumption to the open world
2. Capturing and modeling requirements for adaptive and evolvable Systems  
Functional and extra-functional requirements  
Static adaptation: variation points for software product-lines  
Dynamic adaptation: modeling and reasoning about uncertainty
3. Software architectures and languages supporting adaptation and evolution  
Architectural styles and middleware support  
Self-organizing architectures  
Language support for dynamic software evolution  
Dynamic change management
4. Modeling and analysis  
Modeling the system and the environment  
Assume/guarantee analysis
5. Verification and validation  
Development-time vs. run-time verification and validation  
Monitoring and feedback to support dynamic adaptation

Course organization: the course is organized as a series of lectures (10 hours) and reading assignments to students. The students will be asked to read recent research papers that deal with the subject of the course, and present and discuss them in class. Students' evaluations will be based on attendance and on the presentations.

Note: to better organize the course, please confirm your attendance to Xavier Franch [franch@essi.upc.edu](mailto:franch@essi.upc.edu) no later than June 10th.