Systems Design Laboratory

Welcome

Luca Geretti, Tiziano Villa, Matteo Zavatteri

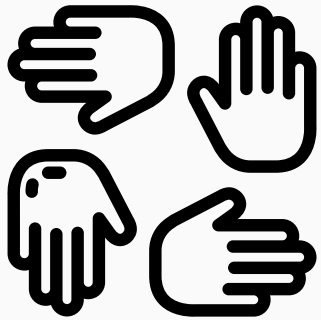
Department of Computer Science, University of Verona, ITALY

First and Most Important

Systems Design Laboratory is not another theory course!

Systems Design Laboratory:

- is a "**hands-on**" modeling course
- provides you with **concrete skills**
- involves the use of several **software libraries**
- is about **solving concrete problems**



Last but not least: plenty of room for **theses**, research, and more (e.g., the ICE lab context)

https://www.icelab.di.univr.it/?lang=en

Learning Outcomes

Objectives

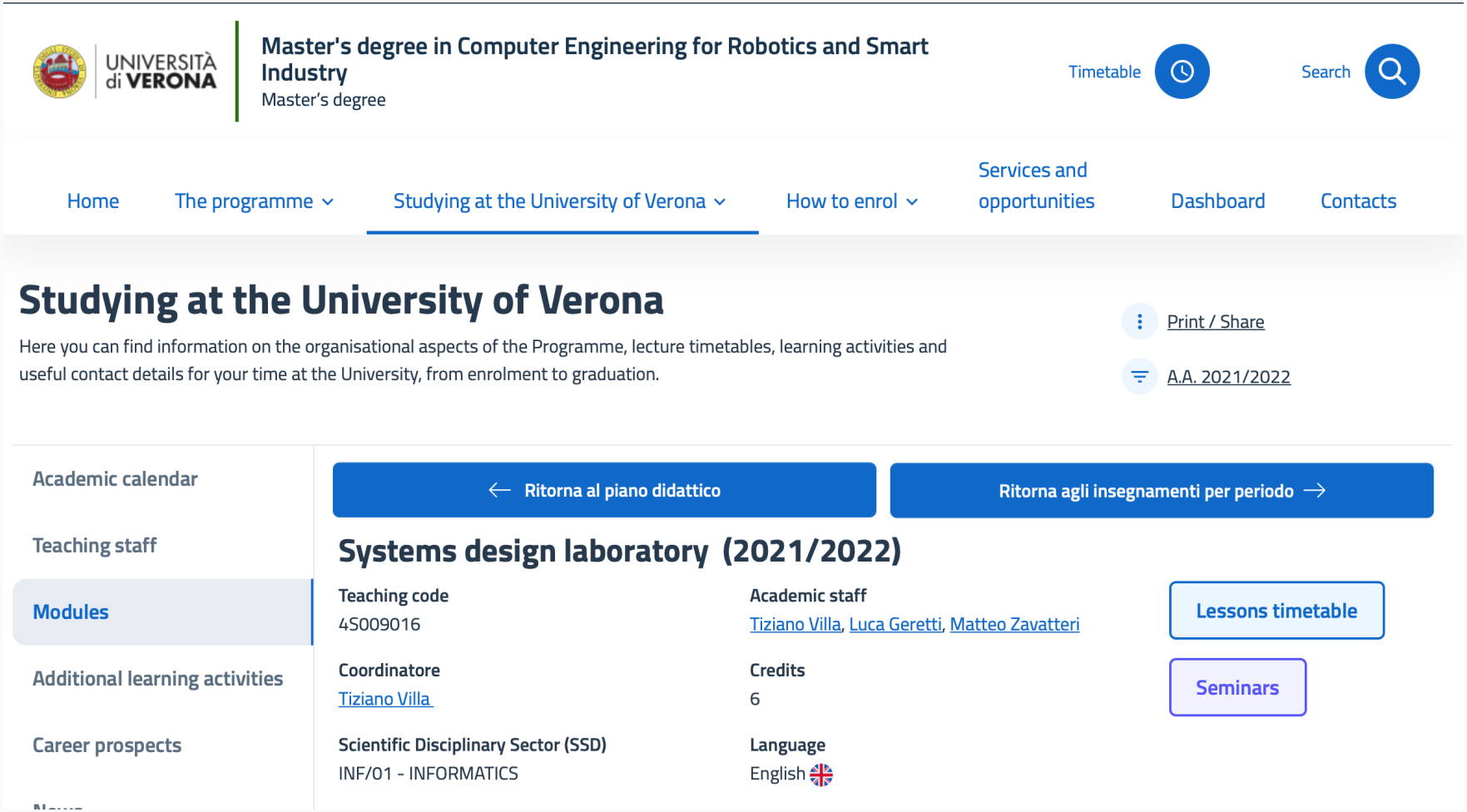
- From theory (i.e., *Discrete Event and Hybrid Systems*) to practice
- Design, analysis, and synthesis of systems starting from models
- Focus on cyber-physical systems, Industry 4.0, and robotic systems

Skills acquired by students

- Autonomous evaluation of advantages and disadvantages of design choices of specification formalisms, and of algorithms for the analysis and synthesis of discrete-event and hybrid systems;
- Ability to work together with application-domain specialists to choose the formal models suitable for the specification, analysis and control of a given system
- Ability to carry on independent study of recent literature.

Essential Information - Homepage and Academic Staff

Essential Information - Homepage



https://www.corsi.univr.it/?ent=cs&aa=2021%2F2022&codiceCs=S81&codins=4S009016&discr=&discrCd=&id=954&menu=Studiare&tab=Insegnamenti&lang=en

Essential Information - Academic Staff

Tiziano Villa
(coordinator)

Unit: Formal models for systems

- **Formal models for discrete-event systems**
- **Boolean functions and networks**
- **Decision diagrams**
- **Multiple-valued and temporal logics**
- **Finite and ω-automata**

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Essential Information - Academic Staff

Matteo Zavatteri

Unit: Discrete Event Systems

- Modeling of plants and control requirements with finite state automata
- Supervisory control
- Eclipse Supervisory Control Engineering Toolkit (ESCET)
- Compositional Interchange Format (CIF specification language)
- Simulation
- Automated synthesis of supervisory controllers
- Design of graphical user interfaces in SVG

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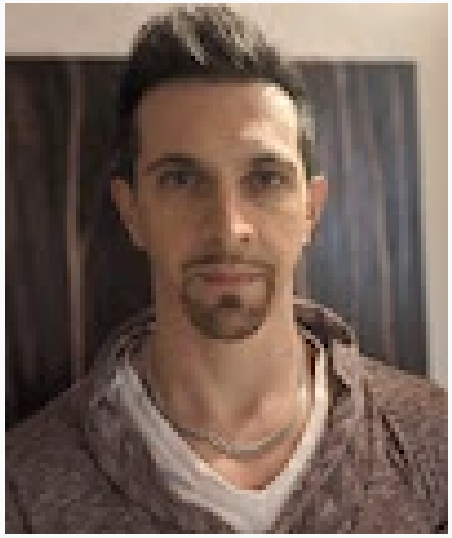
Essential Information - Academic Staff

Luca Geretti



Unit: Hybrid systems

- **Hybrid automata and tools for their analysis**
- **Reachability analysis and set representations**
- **Algorithms for hybrid reachability**
- **Complex systems and their analysis**
- **From static analysis to dynamic analysis**

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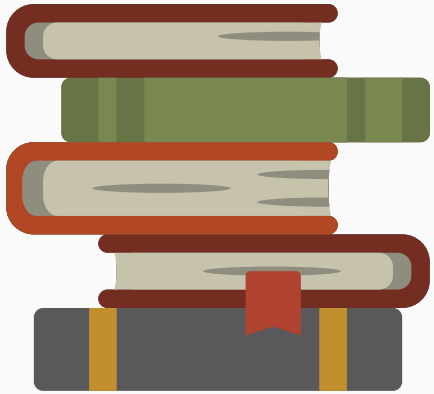
Essential Information - Educational Material

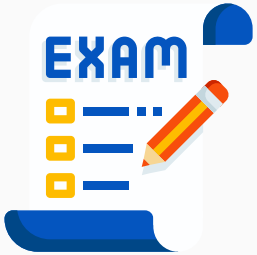


- Specific book chapters (often already studied from previous courses)
- Slides
- Short lecture notes
- Specific case studies analysis
- Online documentation and tutorials
- Example code

Essential Information - Setup

Fully Controllable Setting: You will use your own computer. (Fewer problems, no UniVR/IT dependencies).

Essential Information - Examination Methods



SDL includes 3 subject areas:

- *Formal models for systems (Villa)*
- *Discrete event systems (Zavatteri)*
- *Hybrid systems (Geretti)*

The grade is split as follows

Part	Task description	Max
P	A project chosen in one of the 3 areas	21/30
E1	1 exercise for formal models for systems	3/30
E2	1 exercise for discrete event systems	3/30
E3	1 exercise for hybrid systems	3/30
Final grade P + E1 + E2 + E3		30/30