Safe Intelligent Systems

Subject area: Computer Science/ICT

University:	L'X
Level:	MA all years
Teaching mode:	Hybrid mode: videos for the lectures + interactive part on site with small illustrating exercises (mandatory for students on site, online participation optional but recommended) lab sessions on site (online participation optional but recommended)
Instructor(s):	Sylvie Putot

Short description

Computer-driven control of physical systems is at the center of the emerging field of cyber-physical systems, along which autonomous systems. These systems are most often critical in terms of safety or cost. A challenge is the increasing use of artificial intelligence, whether for perception or control. Mastering the modeling, control and verification of such systems is crucial to guarantee their functionality and reliability.

Full description

The course will be balanced between modeling and verification, and between theoretical foundations and practical aspects.
Contents
- Synchronous models and languages
- Practical introduction to the specification and verification of properties of synchronous modes
- Timed automata
- Temporal logics and model-checking
- Hybrid automata: models, stability and control
- Reachability analysis for hybrid automata
- Robustness of neural networks and reachability of neural network controlled systems

Learning outcomes

Introduction to the theoretical foundations and practical aspects of modelling and verification of cyber-physical systems, introduction to neural network verification

General information

Contact hours per week:	4 hours / week - some asynchrony can be studied upon request)
Total workload:	40 hours (lectures + lab sessions) + personal work (2-4h per week) (in student hours for the whole course)
ECTS credits:	5
Language:	English
Course start date:	19 September 2022
Course end date:	09 December 2022
Add. info about start date:	The course should start the week of September 19, 2022
Weekly teaching day/time:	Monday 8.30 am-12.45 pm
Time zone:	CET (Denmark, Germany, France, Netherlands, Switzerland, Czech Republic)
Further information:	
Prerequisites:	Bachelor of CS (some basic automata theory, some programming in C++ or python, basic notions about the integration of differential equations recommended). Online students are expected to be able to install by themselves simple academic software tools on their own computer.
Activities and methods:	Each 4-hour slot is decomposed in a 2-hour lecture session (videos of lectures + interactive part with small illustrating exercises) a 2-hour lab session: mostly small projects (2-3 weeks), 1 small paper reading project (self-study)
Presence on campus:	no

Final examination

Form:	oral
Date:	12 December 2022
Location/format:	online
Re-sit possibility:	yes
Transcript available:	end of the semester and generally 8 weeks after the exam.
Add. info/requirements:	

Registration

To register for this course, follow the registration requirements of your **home university** as specified here: www.euroteq.eu/courses-registration.

Administration

Number of places: 6

Minimum participants:

Internal course code: INF575

Contact: exchange-international@polytechnique.fr

This course is part of the EuroTeQ Engineering University joint course catalogue 2022/2023. This is a collaborative activity of the partner universities DTU, L'X, TU/e, TalTech, CTU, TUM as well as Technion. Students from these universities can participate in the offered courses. It is the responsibility of the student to check if you fulfil the requirements to participate in a specific course. Students are also advised to check with their home institution how to get recognition of the ECTS credits gained in courses of the EuroTeQ course catalogue. For further information about EuroTeQ Engineering University, visit www.euroteq.eu or get in touch with the above-mentioned point of contact.