	11.09	12.09
	MONDAY	**TUESDAY**
8:00	Welcome	
8:30		
9:00	The Industrial Computer Engineering Laboratory: Franco Fummi	Network Specification and Design for Industrial CPS: Davide Quaglia
9:30		
10:00		
10:30	Coffee Break	Coffee Break
11:00	Modeling Cyber Physical Production Sytems: Michele Lora	Demonstration of the ICE laboratory: Dong Seon Cheng
11:30		
12:00		
12:30	Lunch	
13:00		
13:30	Fast Non Linear Model Predictive Control: Alessandro Beghi	
14:00		
14:30		
15:00	Coffee Break	
15:30	Modeling cyber security for industrial CPS: Marco Rocchetto	
16:00		
16:30		

Speakers

Franco Fummi – University of Verona:

September 11 (9:00 – 10:30) – The Industrial Computer Engineering (ICE) Laboratory

The ICE Laboratory was set up to promote synergy between the technological innovation of Industry 4.0 and the education and research centers located in the Verona area. The ICE Laboratory is divided into several technological areas, each representing a type of production. A logistics system consisting of an AGV transport line connects the different areas, thanks to an innovative software stack for control and monitoring. The lecture will present the five-year experience of setting up a laboratory for advanced manufacturing, focusing on the laboratory architecture, its technologies and the results obtained by relying on such a complex case study.

Bio: Franco Fummi received the Laurea degree in Electronic Engineering at Politecnico di Milano in 1990 and the Ph.D.in Electronic and Communication Engineering in 1994 at Politecnico di Milano. In 1993 he was Research Assistant at the department of Computer Science of the University of Victoria (B.C.). In 1996 he obtained the position of Assistant Professor in Computer Science at the Dipartimento di Elettronica e Informazione of Politecnico di Milano where he remained until October 1998.

In July 1998 he obtained the position of Associate Professor in Computer Architecture at the Computer Science Department of Università di Verona. Since March 2001 he is Full Professor in Computer Architecture at Università di Verona, before at the Computer Science Department and then at the Department of Engineering IM (DIMI). He is leading Cyber-physical and IoT Systems Design (CISD) group of the Università di Verona, currently composed of more than 20 people and working on hardware description languages and electronic design automation methodologies for modeling, verification, testing and optimization of cyber-physical systems. Since 2018 he is the project manager of the Industrial Computer Engineering (ICE) Laboratory at the University of Verona: a facility serving as a technological demonstrator and research laboratory, functional to rethink industrial processes such as additive and subtractive manufacturing, quality control, assembly, and parts storage.

He is also a co-founder of two spin-off companies: EDALab, focused on networked embedded systems design; and the automation control software company FACTORYAL.

Michele Lora – University of Verona:

September 11 (11:00 – 12:30) - Modeling Cyber Physical Production Systems

Model Based Software Engineering (MBSE) techniques allows encapsulating and abstracting into models systems architectures and functionalities. Models are able to capture widely heterogeneous components, dynamics and behaviors as well as a large variety of different viewpoints. Thus, the MBSE approach is particularly well suited to design advanced manufacturing systems. Indeed, supporting MBSE when designing production systems will require to have languages and specification methods powerful enough to capture today's manufacturing requirements and systems' specifications. This lecture presents the languages currently used for the specification of manufacturing systems, such as AutomationML and BPMN. The presentation will highlights the limitations of such languages when dealing with more advanced cyber-physical production systems. Then, it will present some strategies to mitigate such limitations exploiting more advanced languages such as SysML. Finally, it will introduce the features of the upcoming new version of SysML, namely SysML v2, while showing how the new features are better suited to specify advanced manufacturing systems.

Bio: Michele Lora is a Marie Skłodowska-Curie Fellow, holding a joint appointment at the University of Southern California and the University of Verona. Its fellowship aims at implementing the "Design automation for smart Factories" (DeFacto) project that will last until September 2023. The objective of the DeFacto project is to rethinking the design foundations of high-assurance intelligent manufacturing systems. He is also a co-founder of FACTORYAL, a start-up operating in the field of factory automation software.

He received the Ph.D. in Computer Science form the University of Verona in 2016. He also holds a M.Sc. degree in Computer Science and Engineering and a B.Sc. in Computer Science from the University of Verona. Between 2018 and 2020, he was a postdoctoral fellow at the ASSET Research Group of the Singapore University of Technology and Design (SUTD). During his Ph.D. he spent eight months in 2015 at the Donald O Pederson Center of the University of California, Berkeley; at Berkeley, he developed the first prototype of the CHASE framework. Michele is also a proud Erasmus alumnus: he spent one year in 2009 carrying on his research at the Embedded System Lab of the University of Linkoping in Sweden.

Alessandro Beghi – University of Padova:

September 11 (13:30 – 15:00) – Fast Nonlinear Model Predictive Control

Bio: Alessandro Beghi received the Laurea degree cum laude in Electrical Engineering in 1989 and the Ph.D. degree in Control Systems Engineering in 1993, both from the University of Padova, Italy. In 1994 he joined the Department of Information Engineering, University of Padova, Italy, where he is currently a Full Professor of Control Systems Engineering and Chair of the Department Research Board. He held visiting positions at universities and international research centers both in Europe and in the USA. His research interests include modelling and control, filtering and identification, model reduction, fault detection and isolation, and their applications. He has worked on a wide range of control applications, from control of fusion devices, guidance algorithms for virtual vehicles, to control of HVAC&R systems, Adaptive Optics systems, and semiconductor manufacturing processes. He has been responsible of research projects funded by the European Union, the Italian Ministry for Instruction and Research, and the University of Padova. He has been responsible of research activities with national and international companies, among which, Electrolux, Emerson Network Power, Infineon, Aprilia Racing, Ducati Corse. He is co-inventor of 9 Patents on the use of advanced control techniques in different applications fields. He is a member of the Managing Board and scientific advisor of the Regional Industrial Cluster IMPROVENET "ICT for Manufacturing Processes Veneto Network". He is the author of more than 200 publications in journals, books, and conference proceedings.

Marco Rocchetto – V-Research:

September 11 (15:30 – 17:00) Modeling Cyber-Physical System Cybersecurity: from Development Processes to Technical Architectures.

Cybersecurity in Cyber-Physical Systems (CPS) is of paramount importance. Cybersecurity attacks to CPS may impact safety-critical infrastructures to destabilize not just a business but national security. New EU regulations on OT technologies and then on CPS (such as the Machinery Regulation 2023/123) emphasize the impact that a lack of cybersecurity requirements may have on safety regulations. Most cybersecurity standards, such as the ISO 27001 and IEC 62443 (IACS), requires the design and enforcement of cybersecurity policies, procedures, and controls in the business processes, development processes, and within the technical architectures of CPS or OT technology produced or consumed by a company. To comply with cybersecurity standards and new EU regulations, companies are piling up documents over documents describing their security policies and processes, facing the impossible challenge to enforce (and verify) their documentation. The model-based approach presented in this talk shows that formal models, defining cybersecurity policies and procedures, are clearer, easier to maintain, and enabler for an automated model-based cybersecurity risk assessment (requested by most, if not all, cybersecurity standards). During the presentation, state-of-the-art languages and tools are discussed and applied to a reference CPS production process.

Bio: In 2009 he earned a M.S. in Computer Science at the University of Verona (Italy) and passed the State Qualifying Examination in Engineering at the University of Brescia (Italy). In 2014 he earned a PhD (Doctor Europeaus, visiting student at ETH Zurich) in Computer Science at the University of Verona (Italy). From 2010 to mid 2015 he held a research fellow position at the University of Verona (Italy) in the context of two EU-FP7 projects (AVANTSSAR and SpaCIoS). From 2015 to 2017 he held postdoctoral research fellow positions at the SUTD University (Singapore) and at the University of Luxembourg. In 2017 he joined, as a Senior Engineer, the Formal Methods group in the Research Center of the United Technologies Corp. In 2020 he co-founded V-Research, a private R&D center on cybersecurity.

Marco has several patent applications and publications in international scientific conferences and journals. He is reviewer and member of technical program committee of several international scientific workshops, conferences, and journals on cybersecurity. He worked as principal investigator and as main technical contributor in several public and private international research projects.

Davide Quaglia – University of Verona:

September 12 (9:00, 10:30) - Network Specification and Design for Industrial CPS

The lecture consists of two parts. In the first part, I will present a formal approach to specify the communication requirements of a cyber-physical system so that the corresponding network infrastructure can be synthesized automatically. The methodology will be presented by using an example of industrial scenario. The second part will be devoted to describe the communication infrastructure of an Industry 4.0 shop floor and the safety mechanisms that it enables.

Bio: Davide Quaglia received his PhD in Computer Engineering from Politecnico di Torino (Italy) in 2003. Currently he is Associate Professor at the Computer Science Department of the University of Verona (Italy) where he currently teaches various courses on communication networks and network programming. He is author/co-author of about 70 papers and member of IEEE. He is member the technical program committee of ACM/IEEE DATE and Euromicro DSD. His current research interests include Networked Embedded Systems, Networked Control Systems, Cyber-Physical Systems and their applications to Internet of Things, Industry 4.0, smart cities and smart agriculture. He was also co-founder and collaborator of EDALab s.r.l., a spin-off company of the University of Verona.

Dong Seon Cheng – University of Verona:

Bio: Cheng Dong Seon is a Research Associate at the University of Verona (Italy) from 2023. He acquired his Ph.D. in computer science (2008) with work in the field of computer vision and pattern recognition. Machine learning is his main interest, and he has published several conference and journal papers in the field. From 2012 to 2017, he was Assistant Professor at the Hankuk University of Foreign Studies (South Korea) teaching undergraduate and graduate courses in computer science. From 2019 to 2022 he has worked in the private sector for a company in the HVAC industry.

September 11 (11:00 – 12:30) – The Industrial Computer Engineering (ICE) Laboratory in action

The ICE Laboratory is a research facility meant to promote between the technological innovation of Industry 4.0 and the education and research centers located in the Verona area. The laboratory is equipped with a fully fledged production line actually capable of producing goods. This lecture will show, through a demonstration, the technologies implemented in the ICE laboratory in action. The demonstration will be accompanied by an in depth explanation about the integration of the different components in the laboratory, and it will show the reconfiguration abilities of the infrastructure discussing the implications on the scheduling of the production processes.