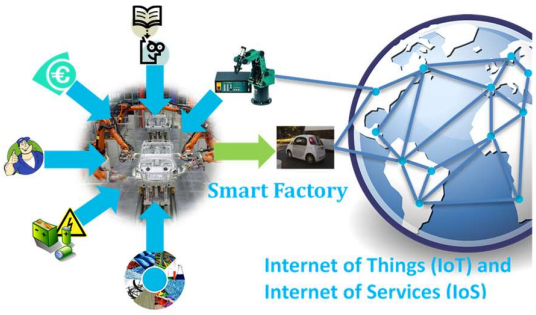
Course syllabus for

P31: International Summer School on Industrial Agents, Introductory/Advanced

Syllabus adopted 2020-03-13 by Professor Bengt-Göran Rosén, Produktion2030 Head of Education



Credits	6 hec
Grading scale	Satisfactory/not satisfactory
Education cycle	Third-cycle
Examiner	Luis Ribeiro, Linköping University
Eligibility	A Master's degree in production engineering or equivalent. No previous knowledge is required except extremely basic notions of programming and automation compatible with most higher education curricula in engineering.
Aim	The summer course aims to enhance the participants' knowledge in the field of distributed and multi-agent systems (MAS) applied to industrial environments, particularly providing hands-on knowledge to develop industrial cyber-physical systems (e.g. production systems, smart grids, etc.). The main objectives of the course are: • Introduce MAS principles as a suitable paradigm to develop industrial distributed collaborative systems. • Provide practical competences in developing MAS applications for industrial automation applications.

- Deployment of agent-based solutions for industrial environments.

Participants will be able to gain a range of theoretical and practical skills necessary to develop agent-based applications to develop industrial cyber-physical systems.

Intended learning outcomes

After completion of the course the course participant should be able to

- Discuss the vision and the main challenges related to the fourth industrial revolution (also known as Industry 4.0) and the main research initiatives in this area.
- Understand the main design and implementation principles that support cyber-physical production system and the system that motivate Industry 4.0.
- Understand what why a cyber-physical system is different from today's conventional system.
- Understand the requirements on the computational and physical infrastructures required to support such a system.
- Design a simple cyber-physical production system.
- Use at a basic level the main technologies supporting such systems:
- Understand how to use today's technologies to create an industrial cyber-physical system.
- Use Intelligent Agents as a mechanism to design the cyber part of a cyber-physical system.

Course content

The course provides, through the view of several international experts, different core subjects involved in the design, development and implementation of very intelligent productions systems. Such systems are able, by design, to take autonomous decisions as a reaction to continuously changing production environments where products being produced change frequently and the system can be seamlessly changed to cater for the new production requirements. Products and production equipment are considered individual intelligent units that have a mechanical/physical part and a cyber component (cyber-physical formulation). The cyber part ensures that the system components interpret each other's actions and needs and behave as a society of intelligent artificial being that can cater for different production disturbances and actively collect data that is further transformed in knowledge used to improve the autonomous response of the system as an whole. Such a vision has lately been put in evidence by several research agendas and in particular the German "Industrie 4.0" that coined the term

	Industry 4.0. However most of the contributions far precede the existence of I4.0 and all the teachers in the course of a very significant track record in these previous contributions dating back in time more than 10 years.
Course organisation	Participants will attend lecture and tutorials delivered by well-known experts in the field from industry and academia to share their experience of developing and applying agent-based solutions in applied industrial context. The summer course will provide a good opportunity to meet prominent researchers, share best practices and to network with participants that may lead to research collaborations in the future.
Examination	A successful completion of this course will be judged on the following: • Course attendance (full course): 1.5 credits • Approval on the practical exercises: 1.5 credits • Final written assignment consisting of a 4000 word essay summarizing the new scientific and technical knowledge acquired and its presentation and discussion: 3 credits
Literature	Will be provided by the different teachers during the course. Other literature or preparation work such as set-up of software tools will be communicated to the students shortly before the course.