Course Title	Smart Society Systems		
Term	Fall semester – term 1 and 2		
Inholland Faculty	Engineering, Design and Informatics (Techniek, Ontwerp en Informatica)		
Language of instruction	English		
Cycle	Bachelor level		
Inholland Location	Alkmaar		
Code Subjects	Code	Subject Title	ECTS
	1920MDTI1Z	Innovation in Engineering	10
	1920MDTI2Z	Multidisciplinary Team Integration	8
	1920MDTI3Z	Domain-specific System Development	10
	Tbd	Writing a research proposal	2
Number of ECTS	30		
Content subjects	Many innovations to address the challenges for the future generations, like the energy transition and climate change, use a combination of physical objects augmented and made smart with software and artificial intelligence. Examples are smart buildings that use innovative systems for heating and cooling, smart cars and smart cities that optimizes energy generation and use, and smart farming that reduces the impact on nature. These systems are called cyber physical systems and there is a great need for engineers that can design these innovative systems make our society sustainable. You will work for either the research center Robotics or the research center Data Driven Smart Society and be part of a multidisciplinary team consisting of industry partners, researchers, and students with various backgrounds. As part of the team you will research and design new innovative technologies related to the fields of robotics or internet of things, with the goal to build smart cyber physical systems that support a sustainable society. The work may include experiments and site visits of industry partners.		
Lecturer(s)	Coordinator: Elmer Hoeksema elmer.hoeksema@inholland.nl Lecturers: Tilmann Köster tilmann.koster@inholland.nl Seethu Christopher seethu.mariyamchristopher@inholland.nl		
Learning outcomes	Upon successful completion of this minor you will be able to: • Understand application domain specific needs and requirements related to cyber physical systems • Design cyber physical system components matching domain specific needs and requirements • Apply robotics or internet of things knowledge and skills to complement other domains		

	• Research emerging technologies in the field of robotics or internet of things applied science
Mode of delivery, planned activities and teaching methods	First week: Available projects and positions are presented and you will apply for positions with your resume and a motivation letter. During a job interview you will be assigned a position for a project. In between: You will work in a small subgroup on tasks related to your project. Each week you will present the results of your subgroup to other students and the project leader. Some weeks industry partners may be present. During the presentation feedback will be given and new tasks will be assigned. The project leader may decide to reassign you to a different or new group. When necessary, workshops may be scheduled. Examples are workshops about the Robot Operating System (ROS), computer vision, neural networks, etc. Mid-term Mid-term individual assessment of your tasks and accomplishments. Final week: Final individual assessment of your tasks and accomplishments and a final presentation of all projects.
Prerequisites and co-requisites (if applicable)	This minor is open to students with knowledge and skills in the fields of programming, linux, robotics, and internet of things. Experience in embedded programming in at least one of the programming languages Python, C#, C(++), or Java is required. You must have successfully completed your propaedeutic year and you need a laptop with the linux, Apple, or Windows operating system, capable of running virtual machines.
Recommended or required reading and/or other learning resources/tools	Many projects use the Robot Operating System and are related to computer vision. Prior knowledge on these topics is not required, but if you would like to prepare for this minor, getting yourself familiar with these topics is a good starting point. As an example, during the previous semester our students worked on the government funded research project smart pear farming. Our students researched and implemented 3D scanning of pear trees, 3D modelling of the trees and a robot simulation in Unity, and researched designing a tree trimming robot.
Assessment methods and criteria	Domain specific system design During the mid-term and final individual assessment you will present your portfolio of accomplished tasks and defend your work during an oral exam. You will need to show your competence in designing a cyber physical system component matching the needs and requirements of the specific application domain. Multidisciplinary team integration During the mid-term and final individual assessment you will present your portfolio of accomplished tasks and defend your work during an oral exam. You will need to show your competence in complementing other domains by applying knowledge and skills related to robotics or internet of things. Technical cyber physical system innovation During the mid-term and final individual assessment you will present your portfolio of accomplished tasks and defend your work during an oral exam. You will need to show your competence in researching emerging technologies in the field of robotics or internet of things applied science and your competence in designing cyber physical system components matching domain specific needs and requirements