General Information	
Academic subject	Internet of Things
Degree course	Computer Science (second-level degree in Computer Science)
Curriculum	Software and Services Engineering
ECTS credits	6
Compulsory attendance	NO
Language	English

Subject teacher	Name Surname	Mail address	SSD
	Giuseppe Desolda	giuseppe.desolda@uniba.it	6

ECTS credits details			
Basic teaching activities	Lectures (3 credits T1) Practice section (1 credit T2) Student project (2 credits T3)		

Class schedule	
Period	First semester
Year	Second year
Type of class	Lecture- workshops

Time management	
Hours	39
In-class study hours	24 T1 + 15 T2
Out-of-class study hours	50 T3

Academic calendar	
Class begins	
Class ends	

Syllabus	
Prerequisites/requirements	
Expected learning outcomes	*Knowledge and understanding* Through the theoretical concepts learned during the teacher's lectures, during which scenarios and real use cases will also be discussed, the student will acquire the skills related to the conceptual bases and fundamental tools for the user-centered design of IoT systems. *Applying knowledge and understanding* During the practice lessons and carrying out a case study in a group, the student will apply the theoretical skills acquired. *Making informed judgements and choices* The practice lessons and the group case study will allow students to use the knowledge transferred by the teacher and to verify the degree of knowledge and understanding achieved. *Communicating knowledge and understanding* With the aim of enhancing their communication skills, students are invited to work in a team. Frequently they will be asked to illustrate the results of exercises carried out autonomously or in groups. In addition to the final exam, the student's ability to discuss the acquired skills will be continuously tested, as the course requires a strong teacher- student interaction during the lessons. *Capacities to continue learning* In order to stimulate the ability to learn autonomously, students are recommended, in addition to the main didactic material, other bibliographic sources to expand some specific topics not covered in detail by the teacher. The student must then prepare a presentation of the

	assigned topic to be illustrated to the teacher and the other students in the class

Contents	1. Basic concepts of the IoT 2. Methods and techniques to design and ideate IoT systems 3. Programming languages, tools and IDE for IoT (e.g., Arduino) 4. Technologies to connect IoT to the cloud 5. Security in IoT 6. Evaluation of internal and external qualities of IoT systems
Course program	
Bibliography	Weiser M. 1999. The computer for the 21st century. SIGMOBILE Mob. Comput. Commun. Rev., 3, 3: 3-11. Starner T. 2001. The challenges of wearable computing: Part 1. IEEE Micro, 21, 4: 44-52. Starner T. 2001. The challenges of wearable computing: Part 2. IEEE Micro, 21, 4: 54-67. Wigdor D., Dennis Wixon Brave NUI World - Designing Natural User Interfaces for Touch and Gesture. Morgan Kaufmann, 2011. The Arduino starter kit book. Boxall, J. 2013. Arduino Workshop: A Hands-On Introduction With 65 Projects. No Starch Press - 392 pages Gusmeroli S., Piccione S., Rotondi D., (2013). A capability- based security approach to manage access control in the Internet of Things. Mathematical and Computer Modelling, 58 (5), 1189-1205, issn: 0895-7177, doi https://doi.org/10.1016/j.mcm.2013.02.006 Nurse, J.R.C., Atamli-Reineh, A., and Martin, A.P. 2016. 'Towards a Usable Framework for Modelling Security and Privacy Risks in the Smart Home'. Proc. HCI2016
Notes	Bibliography will be integrated with the slides available on the ADA platform. For the practice lessons, students are required to use a compatible base Arduino Kit (including an Arduino Uno board, a breadboard, some resistors, buttons, potentiometers, LEDs, wires). One kit is required for each pair of students. Given the COVID restriction, virtual environments that replace Arduino will be considered if needed.
Teaching methods	Lectures in class and practical exercises for identifying, defining and implementing a solution to the problems presented. During the practice lessons students, organized in groups of 3- 4, design and develop an IoT smart environment. The prototype, incrementally created by each group, is regularly discussed with the teacher
Assessment methods	Presentation of the group case study and an oral test on the course topics.

Evaluation criteria	In accordance with the theoretical-practical nature of the course, the learning assessment will already begin during the laboratory lessons. In the oral exam, the student must be able to properly explain the work done during the group project, in particular the problems faced and how these have been solved. In addition, the student will have to answer questions related to the concepts learned during the teacher's classes. The final grade also takes into account how the students apply methods and techniques related to the design, development and evaluation of the IoT environment built during the project.
Further information	None