

SYLLABUS

1. Data about the program of study

1.1 Institution	The Technical University of Cluj-Napoca
1.2 Faculty	Faculty of Automation and Computer Science
1.3 Department	Computer Science
1.4 Field of study	Computer Science and Information Technology
1.5 Cycle of study	Master
1.6 Program of study / Qualification	Data Science / Master
1.7 Form of education	Full time
1.8 Subject code	15.1

2. Data about the subject

2.1 Subject name	Internet of Things				
2.2 Course responsible / lecturer	Prof. dr. eng. Sebestyen-Pal Gheorghe - Gheorghe.Sebestyen@cs.utcluj.ro				
2.3 Teachers in charge of seminars / laboratory / project	Prof. dr. eng. Sebestyen-Pal Gheorghe - Gheorghe.Sebestyen@cs.utcluj.ro				
2.4 Year of study	II	2.5 Semester	1	2.6 Type of assessment (E - exam, C - colloquium, V – verification)	E
2.7 Subject category	DF – fundamentală, DD – în domeniu, DS – de specialitate, DC – complementară				DS
	DI – Impusă, DOp – opțională, DFac – facultativă				DO

3. Estimated total time

3.1 Number of hours per week	3	of which:	Course	1	Seminars	-	Laboratory	1	Project	1
3.2 Number of hours per semester	52	of which:	Course	14	Seminars	-	Laboratory	14	Project	14
3.3 Individual study:										
(a) Manual, lecture material and notes, bibliography										15
(b) Supplementary study in the library, online and in the field										15
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays										15
(d) Tutoring										10
(e) Exams and tests										3
(f) Other activities:										
3.4 Total hours of individual study (suma (3.3(a)...3.3(f)))					58					
3.5 Total hours per semester (3.2+3.4)					100					
3.6 Number of credit points					5					

4. Pre-requisites (where appropriate)

4.1 Curriculum	Big Data, Machine Learning. Distributed systems - bachelor. Design with microprocessors - bachelor
4.2 Competence	Operating with fundamental computer science concepts

5. Requirements (where appropriate)

5.1. For the course	Blackboard, Projector, PC MS Teams Platform
5.2. For the applications	PC, Specific Software

6. Specific competence

6.1 Professional competences	Working with advanced mathematical methods and models, engineering and computing specific techniques and technologies for data analysis.
------------------------------	--

	• Development of advanced techniques, methods and methodologies in the domains of software design, programming systems and environments and their applications . • Innovative design of artificial intelligence and related software and hardware using specific tools. • Contextual integration and exploitation of dedicated information systems. • Creative pooling of multidisciplinary knowledge in the field of computers and information technology for research, design, optimization, implementation and testing of theories, algorithms and original methods specific to artificial intelligence and computer vision systems. • Knowledge extraction and application of ML methods from IoT data • Identify methods to use and apply them rigorously in order to solve a IoT problem
6.2 Cross competences	• Proof of knowledge for the economic, ethical, legal and social context associated with the profession, for correct task identification, schedule of activities, responsible decisions, with the final goal the design, preparation and presentation of a scientific paper. • Clear and concise description of professional activity flows, tasks and outcomes obtained by assuming the role of leader / project manager or as a member of a research team, as result of personal skills of domain specific information synthesis, global vision, communication skills with collaborators, ability of task stages identification. • Exercising the skill of continuous self-education and demonstrating critical, innovative and research abilities. • Capacity for managing the acquisition, the structuring, analysis and visualisation of data and information in the field of specialisation, and for critically assessing the results of this management.

7. Discipline objective (as results from the *key competences gained*)

7.1 General objective	Design, implement, evaluate and integrate an IoT system
7.2 Specific objectives	Understanding of IoT protocols; Design systems for IoT with an increased security. Processing data from IoT environment

8. Contents

8.1 Lectures	Hours	Teaching methods	Notes
IoT introduction notions. Distributed world	1	Lectures using blackboard and projector; involving students in debate	
IoT Architecture	1	Lectures using blackboard and projector; involving students in debate	
Wired and wireless technologies for the IoT	1	Lectures using blackboard and projector; involving students in debate	
Networking Protocols and Standards for Internet of Things	3	Lectures using blackboard and projector; involving students in debate	
Intro to industrial protocols.	1	Lectures using blackboard and projector; involving students in debate	

The Web of Things. W3C architecture	1	Lectures using blackboard and projector; involving students in debate	
Intro to IoT security	1	Lectures using blackboard and projector; involving students in debate	
Applied IoT security	1	Lectures using blackboard and projector; involving students in debate	
Intro to smart cities	1	Lectures using blackboard and projector; involving students in debate	
Data in IoT networks	1	Lectures using blackboard and projector; involving students in debate	
Machine learning applied to IoT	2	Lectures using blackboard and projector; involving students in debate	
Bibliography • Simone Cirani, Gianluigi Ferrari, Marco Picone, Luca Veltri Internet of Things: Architectures, Protocols and Standards. Wiley. 2018. 978-1-119-35967-8 • Internet of Things and Data Analytics Handbook (https://onlinelibrary.wiley.com/doi/epdf/10.1002/9781119173601.fmatter) • Artificial Intelligence for IoT Cookbook: Over 70 recipes for building AI solutions for smart homes, industrial IoT, and smart cities • Building the Web of Things D. D. Guinard and V. M. Trifa MANNING Editions, 2016 • Practical IoT Hacking: The Definitive Guide to Attacking the Internet of Things • The IoT Hacker's Handbook: A Practical Guide to Hacking the Internet of Things • University College London: Internet of Things (IoT): Introduction to Understanding and Designing IoT Systems https://www.ucl.ac.uk/short-courses/search-courses/internet-things-iot-introduction-understanding-and-designing-iot-systems			
8.2 Applications – Seminars/Laboratory/Project	Hours	Teaching methods	Notes
Intro to Rasbery pi, Arduino and Wylidrin STUDIO	2	Oral presentation using slides, discutions (Q&A). Using multimedia tools, interactive teaching tools. Using specific software and hardware for IoT	
Basic Linux tutorial and workplace setup	2	Oral presentation using slides, discutions (Q&A). Using multimedia tools, interactive teaching tools. Using specific software and hardware for IoT	
Interacting with simple hardware components	4	Oral presentation	

		using slides, discussions (Q&A). Using multimedia tools, interactive teaching tools. Using specific software and hardware for IoT	
Interacting with sensors and LCD displays	2	Oral presentation using slides, discussions (Q&A). Using multimedia tools, interactive teaching tools. Using specific software and hardware for IoT	
IoT security example	4	Oral presentation using slides, discussions (Q&A). Using multimedia tools, interactive teaching tools. Using specific software and hardware for IoT	
Data analysis for IoT. Basic setup for ML	2	Oral presentation using slides, discussions (Q&A). Using multimedia tools, interactive teaching tools. Using specific software and hardware for IoT	
Basic models for IoT (with kaggle datasets)	6	Oral presentation using slides, discussions (Q&A). Using multimedia tools, interactive teaching tools. Using specific software and hardware for IoT	
Project work	4	Oral presentation using slides, discussions (Q&A). Using multimedia tools, interactive teaching tools. Using specific software and hardware for IoT	
Presentation of projects	2	Oral presentation using slides, discussions (Q&A). Using multimedia tools, interactive teaching tools. Using specific software and hardware for IoT	
Bibliography			
Veneri, Giacomo Hands-On Industrial Internet of Things: create a powerful industrial IoT infrastructure using industry 4.0. Packt Publishing. 2018. 9781789537222			

- <https://link.springer.com/book/10.1007/978-1-4842-5296-3#toc> (Commercial and Industrial Internet of Things Applications with the Raspberry Pi Prototyping IoT Solutions)
- https://issuu.com/wyliodrin/docs/building_a_smart_city_infrastructur (Building a Smart City Infrastructure using Raspberry Pi and Arduino with Wylodrin STUDIO, tot poli buc)

**Se vor preciza, după caz: tematica seminariilor, lucrările de laborator, tematica și etapele proiectului.*

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The class content was aligned with other similar classes from renowned universities

10. Evaluation

Activity type	Assessment criteria	Assessment methods	Weight in the final grade
Course	Exam	Written exam	50%
Seminar	-	-	-
Laboratory	Exercises	Evaluation during the semester	20%
Project	Presentation, Exercises, Project	Evaluation during the semester, Oral examination	30%
Minimum standard of performance:			

Date of filling in: 26.02.2025	Responsible	Title First name Last name	Signature
	Course	Prof.dr.eng. Gheorghe SEBESTYEN	
	Applications	Prof.dr.eng. Gheorghe SEBESTYEN	

Date of approval in the department	Head of department, Prof.dr.eng. Rodica Potolea
Date of approval in the Faculty Council	Dean, Prof.dr.eng. Vlad Mureșan