

1 UC

English *	Internet of Everything (IoE)
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2 Team

Name *	Research Unit *	Institution *	Email *	ORCID *
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Projects in which you participated relevant to the UC	<p>Smart Smoke-Dry Process</p> <p>VINEVI: An Intelligent Compute and Network Monitoring Architecture</p> <p>Use of Artificial Intelligence to Increase Productivity in Welding (Smart Welding)</p> <p>AgroConnect: A Large Scale IoT Pilot in Agriculture</p> <p>Testbed for Experimentation in Industry 4.0 (TIED4.0)</p> <p>FI-GUARDIAN/Hydro: Environmental IoT Combo Specialized in Water Resources</p> <p>FI-GUARDIAN - Scalable and georeferenced platform for the Internet of Things (IoT)</p>			
Recent publications (relevant to the UC)	<p>A Detailed Relevance Analysis of Enabling Technologies for 6G Architectures, 2023</p> <p>A Comparative Analysis of Machine Learning Techniques for Enhanced Resource Management in Multi-Access Edge Computing, 2023</p> <p>A Comparative Study Between Containerization and Full-Virtualization of Virtualized Everything Functions in Edge Computing, 2021</p> <p>Enabling Multi-domain and End-to-End Slice Orchestration for Virtualization Everything Functions (VxFs), 2020</p>			

Name *	Research Unit *	Institution *	Email *	ORCID *
Rui Luís Andrade Aguiar	Instituto de Telecomunicações	Universidade de Aveiro	ruiagg@ua.pt	0000-0003-0107-6253
Web page *	https://www.it.pt/Members/Index/357			
Projects in which you participated relevant to the UC	<p>Route 25: Agenda for Autonomous, Intelligent, Interoperable and Inclusive Mobility</p> <p>Devise & explore a novel approach for energy consumption and carbon footprint reduction of ICT services in the era of next-generation mobile telecommunications (6G)</p> <p>Evolving FIRE into a 5G-Oriented Experimental Playground for Vertical industries</p> <p>5G-enabled Growth in Vertical Industries</p> <p>SDRT Health - Software Defined Real-Time Health</p>			
Recent publications (relevant to the UC)	<p>P. Escaleira, V. A. Cunha, D.Gomes Gomes, JP Barraca, R. Aguiar, Moving Target Defense for the cloud/edge Telco environments, Internet of Things (Netherlands), Vol. 24, No. 2023, pp. 100916 - 100916, August, 2023</p> <p>J. Meira, G. Matos, A. Perdigão, J. Cação, C. Resende, W. Moreira Moreira, M. Antunes, J. Quevedo, R. Moutinho, J. Oliveira, P. Rendeiro, P. Oliveira, A. Oliveira-Jr, J. S. Santos, R. Aguiar, Industrial Internet of Things over 5G: A Practical Implementation, Sensors, Vol. 23, No. 11, pp. 5199 - 5199, May, 2023,</p> <p>J. Quevedo, R. Ferreira, C. Guimarães, R. Aguiar, D. Corujo, Internet of Things Discovery in Interoperable Information Centric and IP Networks, Internet Technologies Letters, Vol. -, No. -, pp. - -, June, 2017,</p> <p>M. Antunes, JP Barraca, D.Gomes Gomes, R. Aguiar, Smart Cloud of Things: An Evolved IoT Platform for Telco Providers, Journal of Ambient Wireless Communications and Smart Environments, Vol. 1, No. 1, pp. 1 - 24, July, 2016,</p>			

3 Syllabus

Module ¹	Teacher(s)	Topics
1 – Internet of Everything (IoE): Definition, History, Perspectives and Architecture	Rui Luís Andrade Aguiar Flávio de Oliveira Silva	<ul style="list-style-type: none"> • Definition of Internet of Everything (IoE), history and perspectives • IoE Applications • Reference Model and System Architectures for the IoE
2 – Perception and Communication Layer	Flávio de Oliveira Silva	<ul style="list-style-type: none"> • Sensors, Actuators & Devices • Communication protocols between sensors and devices; devices and gateway; gateway and Internet • Security Aspects • Opportunities and Challenges
3 – Processing Layer	Flávio de Oliveira Silva	<ul style="list-style-type: none"> • Middleware • Edge, Fog and Cloud Computing • Big Data • Data analysis • Web Preview • Security Aspects • Opportunities and challenges
4 – Application Layer	Flávio de Oliveira Silva	<ul style="list-style-type: none"> • Vertical applications • Integrations • Security Aspects • Business Models

4 Objectives

At the end of the course, each student should be able to...

O1	Know the various architectures for Internet of Everything (IoE) systems
O2	Explain the characteristics, costs, benefits, and threats of the various technologies available for the perception of data from the environment and for acting in this same environment, considering security aspects
O3	Understand how data flows in IoE systems for both perception, analysis, visualization and action in the environment and the associated security services
O4	Explain the characteristics and support that the various protocols offer for the communication of the components of an IoE system
O5	Know the software components used in the layers in IoE systems
O6	Have a view of the application of IoE in different verticals and the associated business models

5 Bibliography*

Num	Year	Type	Description	Link (ex: DOI)
1	2018	Book	Perry Lea. "Internet of Things for Architects: Architecting IoT solutions by implementing sensors, communication infrastructure, edge computing, analytics, and security", ISBN-13: 978-1788470599, 2018	
2	2020	Book	Kamlesh Lakhwani, Hemant Kumar, Joseph Kofi Wireko. "Internet of Things (IoT): Principles, Paradigms and Applications of IoT", ISBN-13: 978-9389423365, 2020.	
3	2022	Article	X. Kong, Y. Wu, H. Wang, and F. Xia, "Edge Computing for Internet of Everything: A Survey," IEEE Internet Things J., vol. 9, no. 23, pp. 23472–23485, Dec. 2022	https://doi.org/10.1109/IIOT.2022.3200431
4	2021	Article	D. J. Langley, J. van Doorn, I. C. L. Ng, S. Stieglitz, A. Lazovik, and A. Boonstra, "The Internet of Everything: Smart things and their impact on business models," J. Bus. Res., vol. 122, pp. 853–863, Jan. 2021	https://doi.org/10.1016/j.jbusres.2019.12.035
5	2023	Article	W. Z. Khan, W. Rafique, N. Haider, S. Hakak, and M. Imran, "Internet of Everything: Enabling Technologies, Applications, Security and Challenges", Accessed: Jul. 20, 2024. [Online]. Available: https://www.authorea.com/doi/full/10.36227/techrxiv.21341796.v1?commit=ada8bcc8c969c165b4dbd68c6181839b4924147b	https://www.authorea.com/doi/full/10.36227/techrxiv.21341796.v1?commit=ada8bcc8c969c165b4dbd68c6181839b4924147b