

# Internet of Things M – A.Y. 2018/19 – Prof. Roberto Verdone – 3 CFU – First Cycle

## Learning Outcomes

The student will be capable of identifying relevant and business-oriented applications of the IoT, the enabling wireless technologies and platforms, and predict network performance. Nine hours of team working will constitute a conceptual lab where ideas will be shared, compared and discussed under the supervision of the instructor.

## Syllabus

- Introduction (3 hours)

<i>INT</i>	<i>Introduction to the Course</i>	<i>3/3</i>
INT.1	The IoT: Historical Perspective	
INT.2	The IoT: General Framework	
INT.3	The Course	
INT.4	Fundamentals of Wireless Communications	

- Fundamental Tools (9 hours)

<i>NGR</i>	<i>Network Graphs</i>	<i>3/6</i>
NGR.1	Basics of Graphs	
NGR.2	Communication Graphs	
NGR.3	Interference Graphs	

<i>NMA</i>	<i>Networks: Medium Access Control</i>	<i>3/9</i>
NMA.1	Fundamentals of Wireless Controlled and Random MAC	
NMA.2	Aloha and S-Aloha in Compact Networks	
NMA.3	CSMA in Compact Networks	
NMA.4	CSMA in Sparse Networks: Hidden and Exposed Node Problem	

<i>NMH</i>	<i>Multi-Hop Networks</i>	<i>3/12</i>
NMH.1	Radio Network Topologies	
NMH.2	Dijkstra Algorithm	
NMH.3	Routing in Multi-Hop Networks	

- Invent, Conceive, Design the IoT (9 hours)

<i>EWT</i>	<i>Enabling Wireless Technologies</i>	<i>3/15</i>
EWT.1	Short Range Systems: 802.15.4	
EWT.2	Long Range Systems: LoRa	
EWT.3	Network Architectures	

<i>EPL</i>	<i>Enabling Platforms</i>	<i>3/18</i>
EPL.1	Things	
EPL.2	HW/FW Platforms	
EPL.3	Cloud and Data Analytics	

<i>APP</i>	<i>Application Domains</i>	<i>3/21</i>
APP.1	Smart Environments: Agriculture	
APP.2	Smart Environments: Cities	
APP.3	Smart Environments: Industry 4.0	

- Use Cases (3 hours)

<i>UCW</i>	<i>Use Cases from the Real World</i>	<i>3/24</i>
Seminar	Embit srl	
Seminar	Idesio srl	

- ICDA Lab (9 hours)

<i>LIC</i>	<i>Laboratory: Invent and Conceive</i>	<i>3/27</i>
LIC.1	Team Working: Identify Your Application (INVENT)	
LIC.2	Team Working: Identify Your Wireless Technology and the HW/FW Platform (CONCEIVE)	

<i>LDA</i>	<i>Laboratory: Design and Assess</i>	<i>3/30</i>
LDA.1	Team Working: Design Your Network (DESIGN)	
LDA.2	Team Working: Assess Your Network (ASSESS)	

<i>LPD</i>	<i>Laboratory: Presentation and Discussion</i>	<i>3/33</i>
LPD.1	Team Working: Present Your Idea (PRESENT)	
LPD.2	Discussion of Your Idea	