

Internet of Things Technologies

1. **Course number and name:** 020RCTES5 Internet of Things Technologies
2. **Credits and contact hours:** 4 ECTS credits, 2x1:15 contact hours
3. **Instructor's or course coordinator's name:** Samer Lahoud - Melhem El Helou
4. **Text book:**
 - a. **Other supplemental materials:**
Course handouts and tutorials, lab experiments, standards and white papers

5. **Specific course information**

- a. **Catalog description:**
IoT reference model – End-to-end IoT chain – Constraints and challenges of connected devices – Hardware architecture of connected devices – Wireless LAN (IEEE 802.11, IEEE 802.15.4, BLE, ZigBee) – Low power long range networks (LoRa, Sigfox, NB-IoT) – Routing protocols (AODV, OLSR, RPL, LOADng) – IPv6 for IoT – Application layer (MQTT, XMPP, COAP) – Operating systems for connected devices – hands-on and deployment of end-to-end IoT chain
- b. **Prerequisites:** 020INRES1 Introduction to Data Networks
- c. **Required:** Elective for CCE students

6. **Specific goals for the course**

- a. **Specific outcomes of instruction:**
Analyze the constraints of connected objects in terms of energy, computation capability, transmission, and security.
Compare medium access control protocols in IoT.
Assess the challenges of deploying Internet protocols in IoT.
Design and deploy a real prototype of an end-to-end IoT chain.
Analyze and compare the performance of an IoT network using a simulation tool.
- b. **KPI addressed by the course:**

KPI	a2	b1	b2	b3	c1	c2	c3	e2	e3	g2	i2	j1	k1	k2	k3
Covered	x	x	x						x			x		x	x
Assessed	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Give Feedback															

7. **Topics and approximate lecture hours:**

- Introduction to the Internet of Things (1 lecture)
- Hardware architecture of connected objects (1lecture)
- Challenges of connected objects (energy, security, computation capability, transmission interface) (1 lecture)

Wireless LAN (IEEE 802.11, IEEE 802.15.4, BLE, ZigBee) (3 lectures)
Low power long range networks LPWAN (LoRa, Sigfox, NB-IoT) (3 lectures)
Group activity on performance evaluation of medium access protocols (1 lecture)
Routing protocols (AODV, OLSR, RPL, LOADng) (3 lectures)
Activity on simulation of routing in IoT (2 lectures)
IPv6 for IoT (1 lecture)
Application layer (MQTT, XMPP, COAP) (2 lectures)
Operating systems for connected objects (1 lecture)
Activity on evaluation of spectral and energy efficiency of an IoT technology (2 lectures)
Design and deployment of end-to-end IoT chain (4 lectures)
Performance evaluation of the deployed network (3 lectures)