Mobile Networks

- 1. Course number and name: 020REMES4 Mobile Networks
- 2. Credits and contact hours: 4 ECTS credits, 2x1:15 contact hours

3. Instructor's or course coordinator's name: Melhem El Helou

4. Text book:

a. Other supplemental materials:

Course handouts; standards and white papers; research publications; lab experiments

5. Specific course information

a. Catalog description:

This course covers the evolution of mobile networks; link level and system level design aspects of 2G, 3G, and 4G networks: services, radio interface, network and protocol architectures, physical, (transport) and logical channels, signaling procedures, radio resource management and security management; GSM evolution to GPRS and EDGE; UMTS evolution to HSPA and HSPA+; LTE evolution to LTE-Advanced and LTE-Advanced Pro; recent advances in mobile networks; use of professional tools to evaluate and analyze mobile networks.

- b. Prerequisites: 020CSFES3 Wireless Communications
- **c. Required:** Elective for CCE students; required for CCE telecommunication networks option students

6. Specific goals for the course

a. Specific outcomes of instruction:

Defend cellular concepts and functions in mobile networks. Analyze design aspects of 2G, 3G and 4G mobile networks. Analyze radio resource management functionalities in mobile networks. Measure and evaluate the performance of mobile networks. Describe recent advances in mobile networks.

b. KPI addressed by the course:

KPI	a2	b1	b2	b3	c1	c2	e1	e3	g1	g2	i2	j1	k2	k3
Covered	Х	Х	Х	Х	Х	Х	Х	Х				Х	Х	Х
Assessed	Х	Х	Х	Х			Х	Х	Х	Х	Х	Х	Х	Х
Give														
Feedback														

7. Topics and approximate lecture hours:

Cellular concepts and functions in mobile networks; standardization and evolution of mobile networks (2 lectures)

2G networks (GSM): services, radio interface, voice in GSM, radio resource management (with an emphasis on slow frequency hopping) (2 lectures)

2G networks: network and protocol architectures (2 lectures)

2G networks: security management (1 lecture)

2G networks: physical and logical channels (1 lecture)

2G networks: signaling procedures (1 lecture)

GSM evolution to GPRS and EDGE (2 lectures)

3G (UMTS) networks: services and radio interface (2 lectures)

3G networks: network and protocol architectures (1 lecture)

3G networks: link adaptation and radio resource management (with an emphasis on capacity/coverage tradeoffs and cell breathing); simulation of uplink and downlink transmissions in UMTS (2 lectures)

3G networks: security management; physical, transport and logical channels (1 lecture) UMTS evolution to HSPA and HSPA+ (with an emphasis on opportunistic packet scheduling) (2 lectures)

Activity on capture and radio quality analysis in mobile networks (1 lecture)

LTE networks: services and radio interface (2 lectures)

LTE networks: network and protocol architectures; voice in LTE (2 lectures)

LTE networks: data flow management (1 lecture)

LTE networks: link adaptation and radio resource management; security management; physical, transport and logical channels; LTE evolution to LTE-Advanced and LTE-Advanced Pro (1 lecture)

Activity on analyzing and evaluating the performance of mobile networks (1 lecture) Recent advances in mobile networks: Self-Organzing Networks (SON), heterogeneous networks (HetNet), and Cloud radio access networks (C-RAN) (1 lecture)