Mobile Networks

1. **Course number and name:** 020REMES4/020MONES4 Mobile Networks

2. **Credits and contact hours:** 4 ECTS credits, 2x1:15 contact hours.

3. **Name of course coordinator:** Melhem El Helou

3. **Instructional materials:** Course handouts; standards and white papers; research publications; lab experiments

   References:
   - Harri Holma et Antti Toskala, WCDMA for UMTS - HSPA Evolution and LTE, 5th edition, 2010.
   - Harri Holma et Antti Toskala, LTE for UMTS - Evolution to LTE-Advanced, 2nd edition, 2011.
   - Harri Holma, Antti Toskala et Takehiro Nakamura, 5G Technology - 3GPP New Radio, 2020.

4. **Specific course information**
   a. **Catalog description:**
      This course covers the evolution of mobile networks; link-level and system-level design aspects of 2G, 3G, 4G, and 5G networks: services, architectures, radio interface, radio resource management, call flow management, data flow management, mobility 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; 5G network virtualization; recent advances in mobile networks.

   b. **Prerequisites:** 020CSFES3/020WICES3 Wireless Communications

   c. **Required** for CCE Telecommunication Networks Option students; **Selected Elective** for students in the CCE Artificial Intelligence and Software Engineering Options.

5. **Specific goals for the course**
   a. **Specific outcomes of instruction:**
      - Defend cellular concepts and functions in mobile networks.
      - Analyze design aspects of 2G, 3G, 4G, and 5G mobile networks.
      - Analyze radio resource management and mobility management functionalities in mobile networks.
      - Evaluate the performance of mobile networks.
      - Identify and describe recent advances in mobile networks.

   b. **PI addressed by the course:**

PI	1.1	1.2	1.3	2.1	2.2	2.3	2.4	3.2	7.1
Covered	x	x	x	x	x	x	x		x

Assessed	x	x	x	x	x	x	x	x	x

6. Brief list of topics to be covered

- Cellular concepts and functions in mobile networks (5 lectures)
- Standardization and evolution of mobile networks (1 lecture)
- Link-level and system-level design aspects of 2G networks; GSM evolution to GPRS and EDGE (4 lectures)
- Link-level and system-level design aspects of 3G networks; UMTS evolution to HSPA and HSPA+ (4 lectures)
- Link-level and system-level design aspects of 4G networks; LTE evolution to LTE-Advanced and LTE-Advanced Pro (4 lectures)
- Link-level and system-level design aspects of 5G networks; 5G network virtualization (4 lectures)
- Activity on analyzing and evaluating the performance of mobile networks (1 lecture)
- Recent advances in mobile networks (1 lecture)