

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
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 Wireless Communications

c. **Required** for Telecommunication Networks option students; **Selected Elective** for Software Engineering option students

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)