SYLLABUS

Discipline name	Mobile Communications
Profile	Electronics and Telecommunications Engineering
Specialization	Telecommunications Technologies and Systems
Code	51324809-2
Course leader	Associate Professor Romulus Terebes, Ph.D – Romulus.Terebes@com.utcluj.ro
Collaborators	
Department	Communications
Faculty	Electronics, Telecommunications and Information Technology

Sem.	Type of discipline	Course	Applications			Course	Applications			Ind. study	TOTAL	Credits	Form of assessment
		[hours/week]				[hours/semester]							
			S	L	P		S	L	P				
7	**Speciality, Optional**	**2**	**-**	**2**	**-**	**28**	**-**	**28**	**-**	**64**	**120**	**4**	**Exam**

Acquired competences :

Acquired skills (what the student is able to do):

- analyze various mobility scenarios and identify how they are handled by major mobile communication systems
- characterize/ analyze mobile radio channels and to propose adequate solutions
- characterize and understand the architecture of major mobile communication systems
- understand the signal processing tasks used over the radio interface to counterract the effects of the mobile radio environment
- characterize and analyze mobile signaling and transmission protocols
- deep understanding of the signaling procedures used as a support of terminal and service mobility

Acquired abilities (what type of equipment/ instruments/ software the student is able to handle):

- use and configuration of GSM equipments (BTS, BSC, OMC-R) on an fully functional GSM cell
- configuration of GSM radio interface parameters via dedicated software
- use of dedicated software for performing trace decoding and parameter tuning

Prerequisites (if necessary):

Information theory (compression, error control coding), networking

A. Course/Lecture (course/lecture titles)	
1	Mobility specific concepts. Evolution of mobile communications. Standards for mobile communications. The mobile radio channel
2	The GSM system. Standardization phases. Categories of services in GSM. The architecture of a GSM network. Functional description of a GSM network
3	Addresses and identifiers in GSM. Call routing in GSM intra(inter)-PLMN calls, MT calls, MO calls, calls between GSM users
4	The GSM's radio interface. Signal processing for transmission over the radio interface (voice codecs, ciphering, channel coding, channel equalization, modulation)
5	The GSM's radio interface. Logical and physical channels. Mapping logical channels onto physical channels
6	The stack of signaling protocols. Signaling protocols for transmission over the radio, the A and the Abis interfaces. Signaling protocols inside NSS. The SS7 signaling system
7	Signaling procedures. RR, MM and CM procedures
8	Data and bearer services in GSM. The fax and the SMS service. Bearer services
9	Data transmission in a GSM network: transparent and non-transparent connections; the V110 and modified V110 frames; rate adaptation, the RLP protocol.
10	Data transmission in GSM: channels coding, access and interfacing with other networks. HSCSD: basic concepts, modifications of a GSM network for HSCSD support, rate adaptation for HSCSD
11	GSM/GPRS networks: architecture, functional description, GPRS identifiers, logical and physical GPRS channels, temporal multiplexing of logical channels, QoS in GPRS, radio resource sharing with GSM.
12	GSM/GPRS networks: MM and PDP context, the stack of signaling protocols, the stack of transmission protocols. Signaling and transmission procedures in GPRS: the GPRS attach procedure, the PDP context activation procedure, packet based transfer over the radio interface, IP packet routing in GPRS, location and routing area update procedure, cell selection procedures.
13	EDGE: GPRS limitations, classification (ECSD and EGPRS), the architecture of a GSM/GPRS/EDGE network, mechanisms for increased data rates (modulation, link adaptation, incremental redundancy).

SYLLABUS

14	3G systems: the UMTS standard. The architecture of a UMTS network (release 99, Rel 4 and Rel5). Functional description. UTRAN. Multiple access techniques. Specific procedures and mechanisms for accessing the network and for handovers.

B. Applications – **Laboratory** (list of laboratories) 4h modules /2 weeks	
1	Base Transceiver Station. Description and configuration via the BTS terminal application
2	Base Transceiver Station. Maintenance and comissioning
3	Base Station Controller . Description and configuration via an RS232 connection
4	Base Station Controller . Maintenance and comissioning
5	The Operation and Maintenance Centre (OMC-R).
6	Configuration of the radio path parameters via OMC-R
7	Signaling procedures over the radio interface. Real case experiments and trace decoding

C. Individual study (reference study contents, synthesis materials, projects, applications etc.)

2 synthesis reports

Individual study structure	Course study	Synthesis reports	Applications preparation	Examination time	Additional reference study	Total no. of individual study hours
Hours	28	10	14	3	9	64

References (Textbooks, courses, laboratory manual, exercise book)

1 R. Terebes – *"Mobile communication systems. Part one: GSM networks"*, Editura UTPRES, Cluj-Napoca, 2006, ISBN 978-973-662-221, 978-973-622-222-9.
2. S..Redl, N. Weber, M. Olliphant - *"GSM and personal communications handbook"*, Artech House, 1997.
3. G. Giannakis, Y. Hua, P. Stoica, L. Tong -*"Signal Processing Advances in Wireless & Mobile Communications"*, vol.2, Prentice Hall, 2001.
4. M. Mouly. P. Pautet -*"The GSM system for mobile communications"*, 1992.

On – line references

1 G. Heine - GSM networks: protocols, technology and implementation, http://www.esnips.com/doc/1e05dd06-7b8c-44dc-adb6-762ea00ecf38/Book-of-gsm-network2
2. ETSI/3GPP specifications http://www.3gpp.org

Final evaluation	
Evaluation method	Written exam (E) - theoretical subjects and problems
Mark components	Exam (E: 0…10 points); Synthesis report 1 (S1: 0…10 points); Synthesis report 1 (S2: 0…10 points);
Mark computation	M = 0.7E + 0.15S1 + 0.15S2. Pass if: E≥4

Course leader,

Associate Professor Romulus Terebes, Ph.D