

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Electronics, Telecommunications and Information Technology
1.3	Department	Communications
1.4	Field of study	Electronics and Telecommunications Engineering
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Telecommunications Technologies and Systems/Engineer
1.7	Form of education	Full time
1.8	Subject code	TST-E46.10

2. Data about the subject

2.1	Subject name	Cellular Radiocommunications										
2.2	Subject area	Electronics and Telecommunications Engineering										
2.3	Course responsible/lecturer	Associate Professor Emanuel PUSCHITA, PhD										
2.4	Teachers in charge of applications	Associate Professor Emanuel PUSCHITA, PhD										
2.5	Year of study	IV	2.6	Semester	7	2.7	Assessment	Exam	2.8	Subject category	DS/DOP	

3. Estimated total time

Year/ Sem.	Subject name	No. of weeks	Course			Applications			Indiv. study	TOTAL	Credits		
			[hours/ week]			[hours/ semester]							
			S	L	P	S	L	P					
IV/7	Cellular Radiocommunications	14	2	0	2	0	28	0	28	0	48	104	4

3.1	Number of hours per week	4	3.2	of which, course	2	3.3	applications	2	
3.4	Total hours in the curriculum	56	3.5	of which, course	28	3.6	applications	28	
Individual study									Hours
Manual, lecture material and notes, bibliography									28
Supplementary study in the library, online and in the field									8
Preparation for seminars/laboratory works, homework, reports, portfolios, essays									4
Tutoring									2
Exams and tests									3
Other activities									1
3.7	Total hours of individual study								48
3.8	Total hours per semester								104
3.9	Number of credit points								4

4. Pre-requisites (where appropriate)

4.1	Curriculum	Microwaves
4.2	Competence	N/A

5. Requirements (where appropriate)

5.1	For the course	The Technical University of Cluj-Napoca (Video-projector, screen, whiteboard)
5.2	For the applications	The Technical University of Cluj-Napoca (PCs with Internet access, video-projector, screen, dedicated software and hardware tools, QualNet licenses)

6. Specific competences

Professional competences	<p>C4. To design, implement and operate data, voice, video and multimedia services, based on the understanding and application of fundamental concepts from the field of communications and information transmission.</p> <p>C5. To select, install, configure and exploit fixed and mobile telecommunications equipment. To equip a site with common telecommunications networks.</p> <p>C6. To solve wide-band telecommunications networks' specific problems: propagation in various transmission media, high frequency circuits and equipment (microwaves and optical).</p>
Cross competences	N.A.

7. Discipline objectives (as results from the key competences gained)

7.1	General objectives	To develop professional competences in the field of planning and testing Cellular Radiocommunications systems
7.2	Specific objectives	<ol style="list-style-type: none"> To apply the theoretical concepts of Cellular Radiocommunications systems while using professional software tools for design, test and measurements (QualNet, Rohde&Schwarz CMW200 and CMW500). To develop skills and abilities to analyze and evaluate the Cellular Radiocommunications systems

8. Contents

8.1. Lecture (syllabus)		Teaching methods	Notes
1	The cellular radiocommunications networks. Fundamental architecture. Terminology and definitions.	Presentation, exemplification, problem presentation, case study, discussions	Use of .ppt presentation, video-projector, whiteboard
2	The cellular concept. Fundamentals of cellular network planning.		
3	The cellular concept. Channel allocation strategy. Handover.		
4	Interference and network capacity. Cellular traffic.		
5	Measures of spectral efficiency in cellular wireless networks.		
6	Spectral efficiency of modulation techniques in cellular wireless networks.		
7	Spectral efficiency of multiple access techniques in cellular wireless networks.		
	Intermediate evaluation (Week #7)		
8	Evolution of cellular wireless networks from 1G to 4G. Characteristics of representative networks.		
9	GSM cellular network. GSM architecture. Subsystems and entities.		
10	GSM radio systems. Access bursts. GSM physical and logical channels.		
11	GSM frames and GSM frames hierarchy. Mapping of GSM channels.		
12	3G/IMT-2000 requirements and architecture. UMTS cellular network.		

13	+3G HSDPA/HSUPA and 4G LTE cellular networks.		
14	Instruments for test and measurements of 2G to 4G cellular networks.		
	Final evaluation (Week #14).		
8.2. Applications (lab)		Teaching methods	Notes
1	Description of the laboratory structure. Fundamentals of the cellular wireless networks.	Didactic and experimental proof, didactic exercise, simulations, team work	Use of laboratory instrumentation, cellular network simulators, computers
2	Radio propagation in cellular wireless networks.		
3	Fundamentals of the transmission losses in radio networks.		
4	Propagation models in cellular wireless networks.		
5	Multiple access techniques in cellular wireless networks.		
6	Theoretical laboratory evaluation: the effect of physical parameters on cellular wireless networks. (Week #6) Introduction of the QualNet simulation environment.		
7	Modeling of GSM cellular wireless networks using QualNet simulator.		
8	The capacity of GSM cellular wireless network. Voice calls in GSM network.		
9	GSM network planning. Cell ID, neighbor cells, LAI and GSM cellular traffic.		
10	GSM handover.		
11	Modeling of UMTS architecture. UMTS handover.		
12	+3G (HSDPA) handover.		
13	Laboratory practical evaluation: modeling and configuring a cellular wireless network scenario in QualNet from 2G to 3G. (Week #13)		
14	Laboratory recovery and finalization of laboratory activity. Preparation for the final exam.		

Bibliography

1. T. Rappaport, Wireless Communications Principles and Practice, 2nd edition, Prentice Hall, ISBN 0-13-042232-0, 652 pag., 2002.
2. V. K. Garg, Wireless communications and networking, Elsevier, 1st ed., ISBN: 978-0-12-373580-5, 2007.
3. C. Kappler, UMTS Networks and Beyond, John Wiley & Sons, ISBN 9780470031902, 388 pag., 2009.
4. A. Mishra, Cellular Technologies for Emerging Markets: 2G, 3G and Beyond, John Wiley & Sons, ISBN 9780470779477, 330 pag., 2010.
5. J. Olenewa, Guide to Wireless Communications, 3rd edition, Cengage Learning, ISBN-13 987-1-111-54569-7, 2013.
6. E. Puschita, s.a., Radiocomunicatii Celulare - canalul radio - antene - proiectarea sistemelor – Manual de laborator, Editura U.T. PRESS, ISBN 978-973-662-496-4, 170 pag., 2009.

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

Competences acquired will be used in the following COR occupations (Electronics Engineer; Telecommunications Engineer; Electronics Design Engineer; System and Computer Design Engineer; Communications Design Engineer) or in the new occupations proposed to be included in COR (Sale Support Engineer; Multimedia Applications Developer; Network Engineer; Communications Systems Test Engineer; Project Manager; Traffic Engineer; Communications Systems Consultant).

10. Evaluations

Activity type	10.1	Assessment criteria	10.2	Assessment methods	10.3	Weight in the final grade
Course		The level of acquired theoretical knowledge		- Intermediate written evaluation (E1) with 9 questions / problems. - Final written		- 25% (max. 2.5 pts.) - 25% (max. 2.5

			evaluation (E2) with 9 questions / problems	pts.)
Applications		The level of acquired abilities and practical skills	- Intermediate written evaluation (L1) with 9 questions / problems - Practical evaluation (L2) - design a cellular wireless network scenario in QualNet	- 25% (max. 2.5 pts.) - 25% (max. 2.5 pts.)
10.4 Minimum standard of performance				
$E1+E1 \geq 5$ and $L1+L2 \geq 4$ and $0.25+0.25L+0.25T+0.25 \geq 4.5$				

Date of filling in
01.10.2018

Course responsible
Associate Professor
Emanuel PUSCHITA, PhD

Teachers in charge of applications
Associate Professor
Emanuel PUSCHITA, PhD