

SYLLABUS

Discipline name	Cellular Radiocommunications
Profile	Electronics and Telecommunications Engineering
Specialization	Telecommunications Technologies and Systems
Code	51324809-1
Course leader	Professor Tudor Palade, Ph.D – Tudor.Palade@com.utcluj.ro
Collaborators	Assistant Emanuel Puschita – Emanuel.Puschita@com.utcluj.ro
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):
<ul style="list-style-type: none"> characterize the radio mobile environment compute the parameters of the cellular systems analyze the user data and control signals flow. determine the capacity of the system and the cell division need; characterize the performances of different access systems; determine the needed and offered traffic; analyze the overall performances of the heterogeneous networks in terms of specific parameters;
Acquired abilities (what type of equipment/ instruments/ software the student is able to handle):
<ul style="list-style-type: none"> compute and measure the coverage area and traffic capacity using specific equipments; ability to use numerical values form experiments; design mobile networks using dedicated software tools; use the lab instrumentation (power supplies, oscilloscope, function generator, multi-meter, spectrum analyzer, signal generator and receiver) experimentally determine the coverage and the performances of a specific network experimentally measure the parameters of base stations, access points, mobile stations;

Prerequisites (if necessary):
Knowledge about electrical signals, microwave communication systems, radio fixed networks, wired IP core networks.

A. Course/Lecture (course/lecture titles)	
1	Overview on the main cellular systems: AMPS, PDC, TETRA, GSM, UMTS.
2	Radio channel characteristics: propagation fading, outdoor propagation, models Hata and Lee.
3	Radio channel characteristics: indoor propagation models, multipath fading.
4	Dispersive radio channel characteristics, fading models: Rice, Lognormal, Nakagami, Suzuki.
5	Cells and cellular traffic: cell geometry
6	Cells and cellular traffic: cell splitting
7	Cells and cellular traffic: traffic and trunking capacity
8	Multiple access techniques: FDMA
9	Multiple access techniques: CDMA
10	GSM cellular system: GSM characteristics and performances
11	GSM cellular system: architecture
12	GSM cellular system: BTS
13	GSM cellular system: GPRS architecture and interfaces
14	UMTS architecture and interfaces

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B. Applications – Laboratory (list of laboratories), Seminar (contents), Project (project contents)	
1	Cellular mobile communication systems evolution.
2	Cellular mobile communication systems. GSM architecture.
3	Voice and data burst transmissions in GSM system.
4	Dynamic channel allocation. Signaling procedures.
5	Propagation models in cellular radio systems.
6	Study on the received signal level using EDX SignalPro.
7	Basics of radio network planning: concepts, FITNET architecture.
8	Basics of radio network planning: parameters, coverage parameters.
9	Cellular network planning toll. RUNE architecture.
10	Radio network planning: propagation, mobility, signal-to-interference ratio.
11	Cellular radio network planning: case study.
12	2.5G and 3G technologies.
13	Mobility in wireless systems.
14	Cellular mobile communication systems evolution.

C. Individual study (reference study contents, synthesis materials, projects, applications etc.)						
2 synthesis reports						
3 sets of problems (course homework)						
Individual study structure	Course study	Problem solving, laboratory, project	Applications preparation	Examination time	Additional reference study	Total no. of individual study hours
Hours	28	6	18	3	9	64

References (Textbooks, courses, laboratory manual, exercise book)	
1.	Nicolau, Ed.- Manualul inginerului electronist- Radiotehnica I, II, III- Ed. Tehnica,'89, ISBN 973-31-0116-8
2.	Feher, K. – Comunicatii digitale avansate, Vol. I si II, Ed. Tehnica, Bucuresti, 1993, ISBN 973-31-0526-0
3.	Palade, T. – Tehnica microundelor, Genesis, Cluj-Napoca, 1997, ISBN 973-98204-3-3.
4.	Bogdan, I. – Sisteme celulare pentru comunicatii mobile, Matrix Rom, Buc., 1998, ISBN 973-9254-88-8.
5.	Zoican, R., s.a. – Sisteme celulare de telecomunicatii, Matrix Rom, Bucuresti, 1998, ISBN 973-9390-03-X.
6.	Sofron, E., s.a. – Radiocomunicatii speciale, Ed. Militara, Bucuresti, 1998, ISBN 973-32-0503-6.
7.	Palade, T., s.a. -Radiocomunicatii. Indrumator de laborator, Ed. Mediamira, '99, Cluj, ISBN 973-97791-2-3
8.	Palade, T., s.a. – Radiocomunicatii. Culegere de probleme, Ed. Mediamira, '99, Cluj, ISBN 973-97790-9-3.
9.	Mateescu, A. - Sisteme si retele GSM, Ed. Tehnica, Bucuresti, 1999, ISBN 973-31-1357-3.
10.	Marghescu, I., s.a. – Comunicatii mobile terestre, Ed. Tehnica, Bucuresti, 1999, ISBN 973-31-1305-0.
11.	Hammuda, H. – Sisteme radio mobile celulare, Ed. Teora, Bucuresti, 1999, ISBN 973-20-0004-X.
12.	Bajescu, T. – Sisteme personale de comunicatii, Ed. Teora, Bucuresti, 2000, ISBN 973-20-0236-0.
13.	Palade, T. – Radiocomunicatii celulare, Ed. Mediamira, Cluj-Napoca, 2001, ISBN 973-9358-35-7.
14.	Marza, E., s.a. – Comunicatii mobile. Principii si standarde, Ed. Vest, Timisoara, 2003, ISBN 973-36-0374-0
15.	Astilean, A. – Comunicatii fara fir – principii, evolutie, aplicatii; Ed. Mediamira, 2006, ISBN 973-713-111-8

Final evaluation	
Evaluation method	Written exam (E): problem solving (70%) and theoretical subjects (30%).
Mark components	Exam (E: 0...10 points); Laboratory (L: 0...10 points); Homework (H: 0...10 points);
Mark computation	$M = 0.6E + 0.2L + 0.2H$. Pass if: $E \geq 4$ and $L \geq 4$ and $M \geq 4.5$

Course leader,

Professor Tudor PALADE, Ph.D.