

## COURSE DESCRIPTION

### 1. Program identification information

1.1 Higher education institution	University Politehnica of Bucharest
1.2 Faculty	Faculty of Electronics, Telecommunications and Information Technology
1.3 Department	Telecommunications
1.4 Domain of studies	Electronic Engineering, Telecommunications and Informational Technologies
1.5 Cycle of studies	License
1.6 Program of studies/Qualification	Technologies and Systems of Telecommunications (TSTeng)

### 2. Course identification information

2.1 Name of the course		Mobile Communications					
2.2 Lecturer		Prof. PhD. Eng. Octavian Fratu					
2.3 Instructor for practical activities		Lect. PhD. Eng. Ioana Marcu					
2.4 Year of studies	IV	2.5 Semester	8	2.6 Evaluation type	Exam	2.7 Course choice type	Compulsory

### 3. Total estimated time (hours per semester for academic activities)

3.1 Number of hours per week, out of which	4	3.2 course	2	3.3 practical activities	2
3.4 Total hours in the curricula, out of which	56	3.5 course	28	3.6 practical activities	28
Distribution of time					hours
Study according to the manual, course support, bibliography and hand notes					64
Supplemental documentation (library, electronic access resources, in the field, etc)					10
Preparation for practical activities, homeworks, essays, portfolios, etc.					15
Tutoring					0
Examinations					11
Other activities					0
3.7 Total hours of individual study					100
3.9 Total hours per semester					156
3.10 Number of ECTS credit points					6

#### 4. Prerequisites (if applicable)

4.1 curricular	Analogic and Digital Communications Signals and Systems Analysis and Synthesis of Circuits Analogic Integrates Circuits Antennas and Propagation Radiocommunications Circuits and Systems Data Transmission
4.2 competence-based	General knowledge regarding analogic and digital signals, antennas, radio communications system, information transmission, the capacity of using measurement equipment and software tools like MATLAB/SIMULINK

#### 5. Requisites (if applicable)

5.1 for running the course	Not applicable
5.2 for running of the applications	Attending the laboratories is compulsory (according to the rules for bachelor of science studies in UPB).

#### 6. Specific competences

Professional competences	Design, implementation and operation of data, voice, video, multimedia services, based on understanding and applying the fundamental concepts of communication and information transmission. Selection, installation and operation of fixed and mobile telecommunication equipment and network design to ensure a common telecommunication site. Solving problems for broadband communication networks: propagation in different transmission media, high frequency circuits and equipment (microwave and optical).
Transversal competences	-

#### 7. Course objectives (as implied by the grid of specific competences)

7.1 General objective of the course	During the course, students become familiar with general problems regarding the mobile communications: mobile radio channel, multiple access, cellular network. Applications related to GSM, DECT or TETRA technologies are considered.
7.2 Specific objectives	The applications are intended for the students to become familiar with measurement and simulation techniques used in Mobile Communications considering technologies such as GSM, UMMTS in order to evaluate their.

## 8. Content

8.1 Lectures	Teaching techniques	Remarks
<p><b>General Concepts Related to the Mobile Communications Systems:</b> General features and concepts; Mobile communications evolution, Mobile Communications standards, The future of the Mobile Communications.</p>	<p>Teaching is based on the use of a video projector (covering the communication and demonstrative methods); oral communication methods is the expositive one used in a frontal way. Lectures support consists in: lecture notes and presentations, solved and proposed problems. All the materials are available in electronic format, on the Moodle page.</p>	2
<p><b>Mobile Radio Channel.</b>Radio wave propagation; free air wave propagation; two way radio wave propagation, diffraction; Fresnel ellipsoids; Rural area propagation loss prediction models (Egli, CCIR, Carey, etc.).Urban area propagation loss prediction models (Okumura, Ibrahim-Parsons, Lee etc.). Multipath propagation analysis: Rayleigh fading, Rice fading.</p>		10
<p><b>Cellular mobile communications.</b> Splitting in cells, frequency reuse, mobility, handover, etc. Geometrical analysis of cellular networks, dimension of cluster. Radio channel management: perturbations, signal to interference ratio, number of cells per cluster. Channel allocation criteria and algorithms.</p>		6
<p><b>Multiple access techniques with applications in mobile communications networks.</b> Generalities, frequency division multiple access technique (FDMA); time division multiple access technique (TDMA); comparative analysis; code division multiple access technique (CDMA); ALOHA multiple access algorithm: versions, performances; CSMA-CD algorithm; CSMA-CA algorithm; Token-ring multiple access algorithm;</p>		2
<p><b>2G Public Mobile Communications Systems (GSM, GPRS).</b> Technical features of the 2G and 2.5G Systems; GSM Technology; Technical Specifications; General Concepts related to GSM standard; GSM services; Mobile user IDs; GSM architecture; GSM radio access network; GSM protocols; Physical and logical channels; GPRS system; GPRS versus GSM; Circuit switching versus packet switching; GPRS architecture and services.</p>		6
<p><b>Other 2G Mobile Communications Systems.</b>  <b>1. Trunked Radio:</b> Trunked Radio (TETRA)</p>	2	

Networks: basic principle, architecture, technical features, applications, signalling, handover, security. 2. <b>Cordless telephone (DECT) networks</b> : basic principle, architecture, technical features, applications, signalling, handover, security.		
<b>Bibliography:</b> <ul style="list-style-type: none"> <li>• I.Marghescu, Șt.Nicolaescu, N. Coțanis, "Comunicații mobile terestre", Editura Tehnică, 1999.</li> <li>• Mateescu, I.Bănică, E.Borcoci, I.Marghescu, T.Rădulescu, C.Negrescu, S.Zoican, Roxana Zoican, I.Dragu, "Sisteme și rețele GSM", Ed. Tehnică, București, 1999</li> <li>• W.C.Lee, "Mobile Communications DEsign Fundamentals", John Wiley &amp; Sons, 1993</li> <li>• M.Mouly "The GSM System for Mobile Communications", Artech House Publishers, 1992</li> <li>• Moodle Site of ETTI Faculty</li> </ul>		
<b>8.2 Seminary</b>	<b>Teaching techniques</b>	<b>Remarks</b>
Modulation techniques used in Mobile communications Systems. The modulated signal bandwidth.	Teaching is based on oral communication. Students are required to understand the block diagram of the used radio receiver, learn to handle various RF signal generators, measure and calculate various parameters characterizing the performance of the radio receivers, draw graphical characteristics. Teaching materials are contained in the laboratory manual.	1 hours
Radio Wave Propagation. Radio Links path loss evaluation.		2 hours
Radio wave propagation models. Fading margin.		1 hours
Cellular Networks. The number of the cells in a cluster. SINR evaluation		1 hours
Cellular Networks. The available radio channels allocation in a cellular network.		2 hours
<b>Bibliography</b> Exercises sets (with or without solutions) provided in electronic format;		
<b>8.3 Practical Applications</b>	<b>Teaching techniques</b>	<b>Remarks</b>
Radio Wave propagation. Introductory analysis.	Teaching is based on oral communication. Students are required to understand the block diagram of the used radio receiver, learn to handle various RF signal generators, measure and calculate various parameters characterizing the performance of the radio receivers, draw graphical characteristics. Teaching materials are	3 hours
Radio Wave propagation. (the diffraction loss).		3 hours
The dinamic allocation of the radio channels in mobile networks. The analysis of several algorithms performance.		3 hours
Signal processing in GSM.		3 hours
The GSM performance analysis of the performance by using TEMS.		3 hours
Signaling protocols in GSM.		4 hours

Final lab examination	contained in the laboratory manual.	4 hours
Bibliography		
<ul style="list-style-type: none"> <li>Laboratory sheets printed and in electronic format.</li> </ul>		

### 9. Bridging the course content with the expectations of the epistemic community representatives, professional associations and employers representatives for the domain of the program

Mobile communications systems are and will be an important component in the global communication systems. Although the digital transmissions are more and more frequently used, the principles and block diagrams conceived for analogical communications are still valid. The technological solutions in their evolution allows the students a easier assimilation of the fundamental knowledge. The industry and the network providers need specialists with a good knowledge of fundamental aspects, being also capable of adapting to the dramatic evolution of technologies.

The course curriculum corresponds to the current development and evolution, subscribed to the European and global evolution in the field of communications and information technology (C&IT). In the context of the current technological progress of electronic devices, the activity domains that are aimed at are practically unlimited, from cellular telephony, personal communications to wireless communications

The graduates are provided with competences adequate to the current necessities and a scientific and technical training, competitive and of good quality, which will allow them a fast employment after graduation, being perfectly suited to the politics of the Politehnica University of Bucharest, both from the structure and contents point of view, and from the international opening and abilities offered to the students.

### 10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Weight in the final mark
10.4 Lectures	<ul style="list-style-type: none"> <li>Knowledge of the basic theoretical concepts;</li> <li>Knowledge to use the theoretical concepts to solve specific problems;</li> <li>Comparative analysis of the mobile communication technologies.</li> </ul>	<ul style="list-style-type: none"> <li>Three exams given during the semester at scheduled moments;</li> <li>Both theoretical questions and applications will be included.</li> </ul>	50%
10.5 Practical applications	<ul style="list-style-type: none"> <li>aprecierea capacității de rezolvare</li> </ul>	<ul style="list-style-type: none"> <li>In what the seminaries are concerned amid term test during the</li> </ul>	25%+25%

	individuală, independentă a problemelor propuse, în cadrul unei lucrări de control și a unei teme de casă; - aprecierea capacității de a realiza studii și observații experimentale asupra unor sisteme de comunicații mobile	normal classes and home work that will be delivered during the last two weeks of the semester. - In the case of the lab the activity during each practical work will be evaluated and a final exam will be given during the last two weeks of the semester.	
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**10.6 Minimal performance standard**

According to the intern regulations, accumulation of minimum 50 points from 100 with a minimum of 15 points form the laboratory activity.

Date

Lecturer

Instructor for practical activities

02.10.2017

Prof. PhD. Eng. Octavian Fratu

Lect. PhD. Eng. Ioana Marcu




Date

Director of Department,

05.10.2017

Assoc. Prof. PhD. Eng. Eduard Popovici

