

COURSE DESCRIPTION

1. Data about the program

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 Study field	Electronic Engineering, Telecommunications and Informational Technologies
1.5 Cycle of studies	License
1.6 Study program	Technologies and Systems of Telecommunications (TSTeng)

2. Data on discipline

2.1 Course title				Electronic Measuring Instruments			
2.2 Lecturers				Lect. PhD. Eng. Adrian Păun			
2.3 Instructors for practical activities				Lect. PhD. Eng. Alexandru Rusu-Casandra Lect. PhD. Eng. Adrian Păun			
2.4 Year of study	III	2.5 Semester	5	2.6 Evaluation type	Exam	2.7 Type of class	Mandatory

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

3.1 Number of hours per week, out of which	4.5	3.2 course	3	3.3. practical activities	1.5
3.4 Total hours in the curricula , out of which	63	3.5 course	42	3.6 practical activities	21
Distribution time					hours
Study according to manual, course support, bibliography					11
Supplemental documentation (library, electronic access resources, etc)					2
Preparation for practical activities, seminar / laboratory, homework, essays, portfolio, etc					22
Tutoring					
Examinations					4
Other activities					
3.7 Total hours of individual study					41
3.9 Total hours per semester					104
3. 10 Number of ECTS credits points					4

4. Prerequisites (where applicable)

4.1 curricular	Electronic measurement in telecommunications , Electronic devices, Signal and systems
4.2 competence-based	General knowledge regarding signal measurement and processing (sampling, filtering), measuring techniques and systems (scope, multimeter)

5. Corequisites(where applicable)

5.1 for running the course	Not applicable
5.2 for running of the applications	Not applicable

6. Specific acquired competences

Professional competences	The students have to become familiar with general aspects regarding the main techniques and measuring devices used in electronics, focusing on digital ones. The most important devices for measuring parameters in time and frequency domain like digital voltmeter, DMM, digital scope, spectrum analyzer are presented. The main building blocks of the digital measurement devices such as and sampling, quantization, filter, mixing and digital processing block are also briefly described. Students have to appropriate the engineered thinking and acquire the skills to estimate and predict the measurement error and deepening understand of electronic schematics in general. .
Transversal competences	An honorable, responsible and etic behavior, in accordance to the laws, to ensure a proper reputation of this profession

7. The discipline objectives

7.1 General objective of the course	The students have to become familiar with the main techniques and measuring devices used in electronics, focusing on digital ones..
4.2 Specific objectives	The students have to acquire specific engineering skills need to estimate of measurement errors, understanding parameters of measuring devices and how these parameters affect the accuracy of measurements.

8. Contents

8.1 Course	Teaching methods	Observations
Digital to analog converters	A projector is used for displaying schematics, waveforms, graphics and also main ideas, bullet lists etc. The blackboard is used for calculations, proofs, a.s.o. The course is an interactive one and it is	
Analog to digital converters		
Digital scope		
Digital measurement of electric voltage		

Digital measurement of impedance	focused on the issues raised by the students. Course materials, lecture notes and presentations are available on the course site and in printed form.	
Signal and function generators		
Spectrum analyzer		
8.2 Laboratory	Teaching methods	Observations
Steady state measurements.	Students work in teams of two students each, using a set of the following: Tektronix TDS1001 oscilloscope, GW-Instek SFG-2110 generator, GW-Instek GDM-8246 digital multimeter, an analog millivoltmeter, a power supply and test boards (type "solderless breadboard") that they use to assemble circuits from discrete components, and then to measure various parameters	
Distortion measurement.		
ADCs and DACs.		
Digital oscilloscope.		
Impedance measurement.		
Digital voltage measurement.		
Bibliography:		
[1] Course notes available online: www.radio.pub.ro		
[2] Lab notes available online: www.radio.pub.ro		
[3] V. Kester, "Data Conversion Handbook", Elsevier, 2005		
[4] "Agilent Impedance Measurement Handbook", online document		
[5] "Agilent Spectrum Analysis Basics – Application note 150", online document		
[6] S. Ciochină, "Măsurări Electrice și Electronice – partea II", litografia UPB, 1999		

9. Discipline contents connection with expectation of epistemic community representatives, of professional associations and of major employers in the program field

The course objective, namely knowledge of the techniques and measuring instruments used in electronics, is the basic expectation from a electronics engineer able to work either in design and in operation or service

10. Evaluation

Activity type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percentage of final grade
10.4 Course	- ability of fundamental theoretical concepts of electronic measurement instruments; - ability to apply theoretical aspects to solve specific problems, specially measurement errors evaluation;	Written midterm exam	20%
		Homework	10%
		Final exam	40%
10.5 Laboratory	Problem solving during	The 6 laboratories are	30%

activity	laboratory sessions.	graded as an arithmetic average between a worksheet and a theoretical test. 50% of the laboratory grade is obtained by the student from a practical exam.	
Total: 100p.			
10.6 Minimum performance standard			
<ul style="list-style-type: none"> - ability to solve standard problems connected to the material presented during lectures and laboratory sessions. - 50p out of 100p AND 15p out of 30p (Lab activity) AND minimum 50% score at the final exam, under License Regulation of UPB. (Remark: there are: 100p is equivalent to grade 10). 			

Date
25.09.2017

Lecturers

Lect. PhD. Eng. Adrian Păun

Instructors for practical activities

Lect. PhD. Eng. A. Rusu-Casandra

Lect. PhD. Eng. Adrian Păun

Date of department approval
28.09.2017

Department Director,
Assoc. Prof. PhD Eng. Eduard Popovici