

SYLLABUS

Course name	Electronic Measurements
Profile	Electronics and Telecommunications Engineering
Specialization	Telecommunications Technologies and Systems
Code	51322409
Course leader	Assoc. Professor Rodica Holonec– rodica.holonec@mas.utcluj.ro
Collaborators	Assist. Lecturer Bogdan Tebrean- bogdan.tebrean@mas.utcluj.ro
Department	Electrical Measurements
Faculty	Electrical Engineering

Sem.	Course type	Lecture	Applications			Lecture	Applications			Individual study	TOTAL	Credit	Assessment
		[Hours/week.]				[Hours/sem.]							
			S	L	P		S	L	P				
4	Engineering	2	1	1	-	28	14	14	-	64	120	4	Exam

Occupational skills
Knowledge/understanding
After completing the discipline, the students will be able to: <ul style="list-style-type: none"> - Analyse and to interpret the measurement data - Know and to understand the measurement principles and methods. - Know and to use the electronic measurement devices: oscilloscopes, transistors curve tracers, electronic voltmeters, electronic counters - Design and configure a measurement diagram or system using the proper measurement method and devices.
Acquired abilities: (what type of equipment/instruments/software the student is able to handle)
After completing the discipline, the students will be able to: <ul style="list-style-type: none"> - Use the measurement devices from the laboratory; ac and dc measurement bridges, analogue and digital oscilloscope, transistor curve tracer, analogue and digital multimeters, the electronic counters - Record, process and analyze the experimental measurement data - Configure an experimental diagram choosing the correct measurement method and devices - programming virtual instruments in LabVIEW (Laboratory Virtual Instrumentation Engineering Workbench) -basic level

Prerequisites
General knowledge about electrical circuit theory and electronic devices basic principles

A. Lecture (lecture title + curricula)	
1	Measurements theory principles: units standards, scales, measurement methods,
2	Measurement errors and uncertainties. Gauss distribution. Measurement data validation
3	Analogue oscilloscopes. Display systems. The cathode ray tube.
4	The vertical deflection circuits. The Y channel frequency compensated attenuator. The Y channel preamplifier
5	The vertical deflection amplifier. The sensibility of Y channel. The amplifier frequency response. The double channel oscilloscope.
6	Horizontal (X) channel circuits. Time base signal generation. Trigger and synchronization circuits.
7	Dual time base oscilloscope. Synchronization sources and adjustments. Digital Sampling Oscilloscope – Basic operation principles.
8	Voltage to current curve tracers. Bipolar transistors curve tracer. Sweep Oscillators. Frequency characteristics determination
9	Frequency and time digital measurement. Electronic counters functions.
10	Electronic voltmeters. Mean, peak, root-mean-square values detectors.
11	Analogue and digital multimeters. Dual slope integrator. Specific errors.
12	Modulation- demodulation electronic voltmeters. Noise rejection. The vector voltmeter.
13	Synchronous detection applications in the electronic measurement techniques. Semi-automated and automated measurement bridges. Temperature measurement.
14	Virtual instrumentation. Basic components. Data acquisition boards. Software for virtual instrumentation

B1. Applications	
1L	Laboratory presentation. Analogue measurement instruments. Instrumental errors.
2L	The dc (Wheatstone) bridge. Ac measurement bridges (Schering, Maxwell, Wien, Sauty bridges.).

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3L	Q-meter. Measurement functions. Specific measurements.
4L	One channel cathode ray oscilloscope. Typical measurements. Dual time-base oscilloscope.
5L	Digital measurement of period, frequency, time interval. Working with the universal digital counter.
6L	Electronic voltmeters with multiple functions.
7L	Virtual instrumentation. Principles. Temperature measurement. Virtual digital oscilloscope.
1S	Rules and style conventions for expressing values of quantities. Measurement errors. Measurement units.
2S	Measurement uncertainties. Probability level. Histogram. Hypothesis tests.
3S	Vertical channel sensitivity, frequency band, vertical and horizontal deflection coefficients of CRT o-scope
4S	Balanced ac bridges. The strain gauges bridges.
5S	Electronic voltmeters with multiple functions. The guard shield voltmeter. Connecting the guard.
6S	Temperature measurement circuits. Bipolar transistor p-n junction utilization
7S	Digital measurement of frequency, period, frequencies, ratio, phase and of pluses number.
B2. Laboratory room (Room/surface, address) 157/110 m ² , Barițiu Street nr 25; 206/95 m ² , Dorobantilor 71-73	
Seminary room (Room/surface, address) 155/80 m ² , Barițiu Street nr 25	

C. Individual study

1. The study of standards and rules regarding the measurement methods and interpretation of measurement data
2. The study of measurement devices user manuals: Oscilloscope; curve tracer; multiple functions electronic voltmeter; universal counter.
3. Seminar homework. Syntheses

Individual study structure	Lecture notes study	Homework solving, labs, projects	Applications preparation	Assessment time	Supplementary bibliographical research	Total hours individual study
Hours	28	6	18	3	9	64

References – 4/2/3

In UTC-N library

1. Rodica Holonec, Electrical Measurements and Instrumentation, Editura Mediamira, Cluj-Napoca, 2003, 259 p, ISBN 973-9357-42-3
2. Todoran, Gh., Copandean, R; Masurari Electrice si Electronice. Editura Mediamira; Cluj-Napoca. 2003. 282p. ISBN 973-9357-61-X.
3. Munteanu, R., Todoran, Gh.; Teoria si practica prelucrării datelor de măsurare; Editura Mediamira 1997.Cluj Napoca. 350p ISBN 973-9358-09-8.
4. Todoran, Gh. Masurari numerice; Editura UTPRES Cluj-Napoca 1997.200p, ISBN 973-98380-3-0

On – line references

1. Holonec, R. Electronic Measurements course, ppt slides <http://users.utcluj.ro/~holonec/> Activitate didactica/ Electronic measurements/Courses
2. Holonec, R. s.a Electronic Measurements laboratory, <http://users.utcluj.ro/~holonec/> Activitate didactica Electronic measurements/Laboratory

In other libraries:

1. Antoniu M., Masurari electronice. Metrologie, aparate de măsură analogice, Ed. SATYA, Iasi, 1999. ISBN 973-9178-22-7
2. Antoniu M., St. Poli, E. Antoniu, Masurari electronice. Aparate si sisteme de măsură numerice, Ed. SATYA, Iași, 2000, ISBN 973-97945-4-8
3. Antoniu M, Măsurări electronice: Măsurări la frecvențe joase, înalte și optice Ed. SATYA, Iași, 569p ISBN 973-98708-3-X

Assessment rules

Examination mode	Written examination comprising theoretical questions and exercises (3 hours).
Grade components	60 Final Exam (E); 20 Mid Exam (ME), 10 Laboratory (L); 10 Homework (H)
Final grad (G)	$G=(E+ME+L+H)/100$ Condition to take the credits: $G \geq 5$;

Course leader,

Assoc. Professor Rodica HOLONEC, Ph.D.