

<i>Name of the subject:</i> <b>Measurements</b>		<i>NEPTUN-code:</i> KMAMT11AND	<i>Contact hours/week:</i> 2 lectures + 0 practice + 0 lab. practice
<i>Credits:</i> 2 <i>Requirement:</i> examination		<i>Prerequisite:</i> Electricity I practice. KMAVT12AND	
<i>Lecturer:</i> Zsolt Markella	<i>Beosztás:</i> associate professor	<i>Kar és intézet neve:</i> Kandó Kálmán Faculty of Electricity Institute of Instrumentation and Automation	

<b>Subject</b>		
<i>Aim of the course:</i> To attain the measuring principles, necessary for measuring basic electrical quantities. Knowledge of construction and handling of most important electrical measuring instruments, interpretation of their technical specification. Knowledge, necessary to select optimal measuring methods and instruments.		
<b>Thematics:</b>	<b>Week</b>	<b>Cont. hours</b>
Basic concepts of measurements. Definition and aims of measurements. Classification of signals. Units of quantities. The SI system of technical units. Etalons of electrical quantities. Classification of measuring methods. For of the result measurement. Sources of errors in measurements. Description of errors.	<b>1.</b>	<b>3</b>
Series of measurements, evaluation of the results. Histogram and probability density function. Distribution functions. Best estimation of the result of the measurement. Accumulation of the errors during mathematical operations. Displaying the measured results. Regression. Correlation.	<b>2.</b>	<b>3</b>
Measuring direct voltages. Classification of the instruments. Electromechanical instruments. Construction and operation of the hard-magnet instruments. Equation of the instrument, parameters, sources of errors. Application for measuring DC voltage and for DC current. Compensation method for measuring DC voltage.	<b>3.</b>	<b>3</b>
Classification of electronic voltmeters, block-diagrams, operation, application fields. Digital methods to measure direct current and voltage, their specifications. Methods for analog-digital conversion, their parameters.	<b>4.</b>	<b>3</b>
Measuring alternating voltage. Useful parameters of alternating voltage and current. Operating principle and specification of electromechanical measuring instruments for alternating voltage. Classification and parameters of analog electronic instruments for measuring alternating voltage. AC/DC converters and their specification. Digital instruments for measuring alternating voltage, the most important specification.	<b>5.</b>	<b>3</b>
Measuring distortion of sinewave signals, block-diagram and application of distortion meters. Oscilloscopes: classification, basic operation modes of analog oscilloscopes.	<b>6.</b>	<b>3</b>
Units of oscilloscopes: the mainframe, the vertical deflection system, operation modes, parameters. The horizontal deflection system, operation modes, parameters. Triggering modes. Application of oscilloscopes for measuring amplitude, frequency, time, phase-shift etc.	<b>7.</b>	<b>3</b>
Classification of generators, basic block-diagrams. Sine-wave generators. The construction of the sound-frequency generators, important parameters. Operation and specification of function generators.	<b>8.</b>	<b>3</b>
Principle and specification of synthesizing generators. Operating principle, specification, setup and handling of pulse generators. Measuring current by converters. Measuring resistance.	<b>9.</b>	<b>3</b>
Application of DC bridges for measuring electrical resistance. Digital method for measuring resistance. the four-wire method. Analog and digital multimeters, block-diagrams.	<b>10.</b>	<b>3</b>

Conditions of entering to the exam:

Visit of the lectures is obligatory.

During the semester we will write 3 tests.

The test work contains 7 questions. The student get 1 points for every correct answers.

Every test must reach at least 3,5 points.

At the end of the semester students should write an accidental test from the whole semester for entering to the exam.

This test contains 21 questions.

A test work is successful if it reaches at least 10,5 points

The way of the exam is oral.

**Literature:**

**Compulsory:**

Dr. Horváth Elek: Méréstechnika jegyzet (ÓE-KVK-1161)

**Optional:**

Kiss Ernő: Elektronikus műszerek

Schnell: Jelek és rendszerek méréstechnikája

Helfrick-Cooper: Modern Electronic Instrumentation and Measurement Techniques

Chin: Electronic Instruments and Measurements