

2.3.2 Instrumentation and Measurement

Instrumentation and Measurement
--

Module Summary
Module code: EEIB320
Module coordinator: Prof. Dr. Manfred Litzenburger
Credits (ECTS): 7 Points
Semester: 3. Semester
Pre-requisites with regard to content: Modules Circuit Analysis I and II, Electromagnetic Fields, Mathematics I and II
Pre-requisites according to the examination regulations: Regarding to the examination regulations no pre-requisites are required
Competencies: The students are able to treat measurement tasks by <ul style="list-style-type: none"> • Assessing the measurement uncertainty of a measurement chain by means of error calculation and error propagation • Understanding the mode of operation of electrical measurement methods • Using the oscilloscope as a universal measurement tool • Selecting and applying electrical measurement methods according to the requirements on the measurement problem to gain a thorough and comprehensive understanding of measurement systems for conceiving and implementing complex measurement tasks.
Assessment: Exam, 120 minutes. Practical knowledge of dealing with measurement equipment and the laboratory experiments is checked by means of colloquia and written reports for the experiments.
Usability: This module presents methods and electronic circuits for measurement tasks which are applied e.g. in control theory, automation engineering, information processing and characterisation of electric and electronic devices.

Course: Instrumentation and Measurement
Module code: EEIB321
Lecturer: Prof. Dr. Manfred Litzenburger
Scope of weekly semester hours (SWS): 4
Semester of delivery: Winter semester
Type/mode: Lecture, Compulsory subject
Language of instruction: English
Content:

<ul style="list-style-type: none"> • physical quantities and units of measurements, international system of units • sources of errors, measurement uncertainty, error propagation • oscilloscope • electromechanical meters • measurement methods for DC voltage and current • measurement methods for AC voltage and current • measurement of non-electrical physical quantities, e.g. temperature • operational amplifiers in measurement instrumentation • digital signal acquisition, analog-to-digital- / digital-to-analog- conversion • measurement standards and references • electrical power measurement in AC and three-phase current • simulation of measurement methods with LT-Spice
<p>Recommended reading:</p> <ul style="list-style-type: none"> • Will be announced in the lectures

Course: Instrumentation and Measurement Lab
Module code: EEIB252
Lecturer: Prof. Dr. Manfred Litzenburger
Scope of weekly semester hours (SWS): 2
Semester of delivery: Winter semester
Type/mode: Labor, Compulsory subject
Language of instruction: English
<p>Content:</p> <ul style="list-style-type: none"> • Computer-based data acquisition with digital multimeter, 2-wire- and 4-wire measurement of contact resistance, statistical data analysis • Measurements with the digital oscilloscope, characterisation of periodic signals, FFT-analysis, chatter of switches and relays • Temperature sensors and measurements, thermal conduction, model-based data analysis and characterisation of thermal parameters • Fundamentals of operational amplifiers, measurement of characteristic parameters and basic amplifier circuits • Application of operational amplifiers: integrator, differentiator, precision rectifier, measuring bridge amplification with instrumentation amplifier, lock-in amplifier • Characterisation of AD- and DA-converters, dual slope principle, successive approximation register principle, simulations with LT-Spice
<p>Recommended reading:</p> <ul style="list-style-type: none"> • See corresponding lecture