Università degli Studi di L'Aquila - Dipartimento di Ingegneria e Scienze dell'Informazione e Matematica

Course catalogue

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Programme of Course "Misure Elettroniche"

- Code: I0651
- Type of course unit: Compulsory (Laurea in Ingegneria dell'Informazione curriculum Elettronica)
- Level of course unit: Undergraduate Degrees
- Semester: 1

Number of ects credits: (Laurea in Ingegneria dell'Informazione) 9 (workload 225 hours)

Teachers: Giovanni Bucci

1	**Course objectives**	The goal of this course is to provide the measurement and working principles of various instruments and devices used to measure electrical parameters. On successful completion of this module, the student should understand the fundamental concepts of measurement theory and should be aware of potential applications of basic electronic instrumentation in different engineering fields.
2	**Course content and learning outcomes (dublin descriptors)**	Topics of the module include: • Fundamentals of measurement theory. Measurement of electrical resistance and impedance. Principle of moving coil instruments. Electronic analog and digital voltmeters. Electronic counters. Basic sensors and transducers. Data Acquisition Systems. Digital oscilloscopes. Spectrum analyzers. Electronic wattmeters On successful completion of this module, the student should : • have profound knowledge of basic concepts and definitions in measurement, have profound knowledge of basic measurement theory, have knowledge and understanding of working principle of basic electronic instrumentation, such as voltmeters, ammeters, counters, digital scopes, spectrum analyzers, wattmeters • demonstrate skill in main instruments and ability to measure voltage and current signals and their associated quantities, such as power, energy, frequency, time and impedance, demonstrate capacity for defining and selecting appropriate strategies to solve problems using electrical measurements as the subject • understand and explain the validity and the reliability of measures taken from a given system attached to a signals source, demonstrate capacity to communicate the results of technical works in a clear and coherent way, with the generation of systematic and meaningful documentation for any designed and assembled system
3	**Course prerequisites**	The student must know the basic notions of basic electric circuits, circuit analysis, and analog electronics.
4	**Teaching methodsand language**	Lectures, laboratory team work. **Language**: Italian **Reference textbooks** • ***AC Voltage Measurement Errors in Digital Multimeters, Digital Multimeter Measurement Errors Series***. Agilent Technologies, Inc.. (vol. AN 1389-3) 2002. • Dale Cigoy, ***Accurate Low-Resistance Measurements Start with Identifying Sources of Error***. Keithley Instruments, Inc.. 2010. • ***Agilent Spectrum Analysis Basics***. Agilent Technologies. (vol. AN 150) 2006. • Robert A. Peura and John G. Webster, ***Basic Sensors and Principles, Medical Instrumentation Application and Design***. John G. Webster. 2009. • John J. Corcoran, ***Electronic Instrument Handbook: Analog-to-Digital Converters***. Agilent technologies. 2004. • ***Enhanced Resolution in LeCroy Digital Oscilloscopes***. LeCroy Corporation. (vol. AN 006) • Keith Birch, ***Estimating Uncertainties in Testing, Measurement Good Practice Guide No. 36***. British Measurement and Testing Association. • ***Fundamentals of the Electronic Counters, Electronic Counter Series***. Hewlett-Packard Company. (vol. AN 200) 1997. • Harry N. Norton, ***Handbook of transducers***. Prentice Hall PTR. 1989. • ***High Resistance Measurements, Application Note Series***. Keithley Instruments,

		Inc. (vol. 312) 2005. • Gerhard Bohm, Günter Zech, ***Introduction to Statistics and Data Analysis for Physicists***. Verlag Deutsches Elektronen-Synchrotron. • ***Isolated Current and Voltage Transducers. Characteristics - Applications Calculations***. LEM Publication . (vol. CH 96101 E) • ***Linear Circuit Design Handbook***. • John G. Webster, ***Measurement, Instrumentation, and sensors***. CRC Press, IEEE Press. 1999. • Morris Engelson, ***Modern spectrum analyzer theory and applications***. Artech House. 1984. • ***Oscilloscope Fundamentals***. Tektronix. 2009. • Peter J. Pupalaikis, ***Random Interleaved Sampling (RIS)***. LeCroy Corporation. • ***Sensor Technology Handbook***. Elsevier. (vol. 1) • M. J. Usher, ***Sensors and transducers***. Macmillan. 1985. • Robert A. Witte, ***Spectrum and network measurements***. Prentice Hall . 1991. • Walt Kester , ***The Data Conversion Handbook***. 2005. • Barry N. Taylor and Ambler Thompson eds., ***The International System of Units (SI)***. NIST Special Publication. (vol. 33) 2008. • ***Understanding SAR ADCs: Their Architecture and Comparison with Other ADCs***. Maxim integrated TUTORIAL. (vol. 1080) 2001. • ***What is the difference between an equivalent time sampling oscilloscope and a real-time oscilloscope***. Agilent Technologies. (vol. AN 1608) 2008. • G. Bucci, C. De Capua, C. Landi, ***Wiley Survey of Instrumentation and Measurement: Power and Energy: Power Measurement***. John Wiley and Sons. 2001.
5	**Assessment methods**	Oral exam: discussion on any three topics from the course, proposed by the teacher during the examination.