



Course guides

230319 - SMBC - Low Cost Measurement Systems

Last modified: 06/05/2019

Unit in charge: Barcelona School of Telecommunications Engineering
Teaching unit: 710 - EEL - Department of Electronic Engineering.

Degree: BACHELOR'S DEGREE IN TELECOMMUNICATIONS SCIENCE AND TECHNOLOGY (Syllabus 2010). (Optional subject).
BACHELOR'S DEGREE IN AUDIOVISUAL SYSTEMS ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN ELECTRONIC SYSTEMS ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN TELECOMMUNICATIONS SYSTEMS ENGINEERING (Syllabus 2010). (Optional subject).
BACHELOR'S DEGREE IN NETWORK ENGINEERING (Syllabus 2010). (Optional subject).
BACHELOR'S DEGREE IN TELECOMMUNICATIONS TECHNOLOGIES AND SERVICES ENGINEERING (Syllabus 2015). (Optional subject).
BACHELOR'S DEGREE IN ELECTRONIC ENGINEERING AND TELECOMMUNICATION (Syllabus 2018). (Optional subject).

Academic year: 2019 **ECTS Credits:** 2.0 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: Vargas Drechsler, Manuel
Others: Torrents Dolz, Josep Maria Vargas Drechsler, Manuel

PRIOR SKILLS

A little bit of English.

REQUIREMENTS

Curiosity.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Generical:

10 ECI. They will have acquired knowledge related to experiments and laboratory instruments and will be competent in a laboratory environment in the ICC field. They will know how to use the instruments and tools of telecommunications and electronic engineering and how to interpret manuals and specifications. They will be able to evaluate the errors and limitations associated with simulation measures and results.

08 CRPE. ABILITY TO IDENTIFY, FORMULATE AND SOLVE ENGINEERING PROBLEMS. To plan and solve engineering problems in the ICT with initiative, making decisions and with creativity. To develop a method of analysis and problem solving in a systematic and creative way.

Transversal:

04 COE. EFFICIENT ORAL AND WRITTEN COMMUNICATION. Communicating verbally and in writing about learning outcomes, thought-building and decision-making. Taking part in debates about issues related to the own field of specialization.

TEACHING METHODOLOGY

The CDIO methodology applied to low cost measurement systems will be used. The CDIO methodology consists of conceiving, designing, implementing and operating systems, in this case based on the sound system of the personal computer.



LEARNING OBJECTIVES OF THE SUBJECT

Introduce students to low cost measurement systems. Introduce students to hardware, software, and free cultural works. Introduce students to LabVIEW programming environment. Introduce students to CDIO methodology. Introduce students to minimize costs. Introduce students to reporting. At the end of the seminar students will be able to program and configure the PC to make a low cost measurement system.

STUDY LOAD

Type	Hours	Percentage
Self study	30	60.00
Hours small group	20	40.00

Total learning time: 50 h

CONTENTS

An introduction to Low cost measurement systems

Description:

An introduction to low cost measurement systems. Measurement systems offer low cost alternative to traditional systems of measurement. We will study the advantages and disadvantages of low cost measurement systems compared to traditional measurement systems. We will list a few low cost systems. In future lectures, we will turn the PC into a measurement system.

Hardware: PC's sound card

Description:

Hardware: PC's sound card

Software: LabVIEW

Description:

Software: LabVIEW

Related activities:

License

Open source hard&soft

Description:

Open source hard&soft

Examples on soundcard

Description:

Examples on soundcard



Uncertainty evaluation

Description:

Measurement uncertainty evaluation

Reporting

Description:

Reporting

CDIO on low cost system

Description:

CDIO on low cost system

ACTIVITIES

Programming and Assembly of circuits. Measurements. Report writing.

Full-or-part-time: 1 h

Laboratory classes: 1h

GRADING SYSTEM

Evaluation of the ability to measure in an electronic laboratory.

EXAMINATION RULES.

Continous evaluation. If additional tests are scheduled, they will be in the lab, alone or in small groups.

BIBLIOGRAPHY

Basic:

- Hagler, M.O.; Mehrl, D.J. "A PC with Sound Card as an Audio Wavefrom Generator, a Two-Channel Digital Oscilloscope and a Spectrum Analyzer". IEEE Transactions on education [on line]. 2001, vol. 44, num 2 [Consultation: 26/06/2019]. Available on: <http://ieeexplore.ieee.org/document/925849/>.

- Garratt, S. Sound card oscilloscope:build better electronics projects. Cracòvia: Steve Garratt, 2014. ISBN 9781728791630.

Complementary:

- González, M.G.; Santiago, G.D.; Slezak, V.B.; Peuriot, A.L. "Simple synchronic detection at audio frequencies through a PC sound card". Review of scientific instruments [on line]. 78, 055108 (2007) [Consultation: 02/02/2015]. Available on: <http://scitation.aip.org/content/aip/journal/rsi/78/5/10.1063/1.2740063>.

- Quan, X.; Zhou, N.; Wu, H. "Design of sound card electrocardiosignal acquisition system based on LabVIEW". Multimedia Technology (ICMT), 2011 International Conference on [on line]. p. 282 - 285 [Consultation: 13/07/2015]. Available on: http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=6003018&tag=1.

- Comité Consultivo de Unidades (CCU) del Comité internacional de Pesas y Medidas (CIPM). Resumen del Sistema Internacional de Unidades, el SI [on line]. 2a ed. Madrid: Centro Español de Metrología, 2006 [Consultation: 02/05/2020]. Available on: https://www.cem.es/sites/default/files/files/resumen%20del%20sistema_internacional_de_unidades.pdf.



- Zeitnitz, C. Soundcard scope [on line]. Colònia, Alemanya: Christian Zeitnitz, 2011 [Consultation: 16/07/2015]. Available on: http://www.zeitnitz.de/Christian/scope_en.
- Proceedings of the 20th IEEE Instrumentation Technology Conference [on line]. Piscataway, NJ: IEEE Service Center, 2003 [Consultation: 16/07/2015]. Available on: <http://ieeexplore.ieee.org/xpl/conhome.jsp?punumber=1000377>.
- Recomendaciones del Centro Español de Metrología para la Enseñanza y utilización del Sistema Internacional de Unidades de Medida [on line]. Madrid: Ministerio de Industria, Energía y Turismo, 2013 [Consultation: 02/05/2020]. Available on: https://www.cem.es/sites/default/files/files/recomendaciones_cem_ensenanza_metrologia.pdf.
- Estella, M.; Serra, E.; Mateu, R.; Marigó, M.; de Blas, M.. Argumenta [on line]. Argumenta, 2001-2006 [Consultation: 27/01/2015]. Available on: http://wuster.uab.cat/web_argumenta_obert/.

RESOURCES

Computer material:

- LabVIEW. LabVIEW
- Laboratori C5S101. Laboratory