

Curricular Unit Form (FUC)

Course:	FIRST CYCLE IN MECHANICAL ENGINEERING					
Curricular Unit (UC)	Electronics and Instrumentation				Mandatory	X
					Optional	
Scientific Area:	Energy and Control Systems					
Year: 2°	Semester: 2°	ECTS: 4,0		Total Hours: 3,0		
Contact Hours:	T:	TP: 45,0	PL:	S:	OT:	TT: 45,0
Professor in charge		Academic Degree /Title		Position		
Francisco Mateus Marnoto de Oliveira Campos		PhD		Assistant Professor		

T- Theoretical ; TP - Theory and practice ; PL - Laboratory ; S - Seminar ; OT -Tutorial ; TT - Total of contact hours

Entry into Force	Semester: Winter	Academic Year: 2016/2017
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Objectives of the curricular unit and competences (max. 1000 characters)
<p>The course aims at providing the knowledge and skills necessary for: a) Design of electric circuits for analog signal conditioning b) Selection of active and passive components for analog signal conditioning, c) Design of electric circuits for digital signal conditioning and d) Selection of equipment for data acquisition.</p> <p>The course also encourages the student to develop autonomy and a critical perspective on the analysis and fault diagnosis of electric circuits.</p>

Syllabus (max. 1000 characters)

INTRODUCTION

Review of the basic concepts on electrical variables; Electric variables measurement; Resistive circuits analysis; Kirchhoff's circuit laws; Thevenin's and Norton's theorem and Millman's equation.

SEMICONDUCTOR DEVICES

Semiconductor materials main properties; Energy bands theory; Diode behavior and properties; methods for solving circuits with diodes; diode's main circuit applications; Bipolar junction transistors and field effect transistors; Transistor circuit analysis; transistor's main circuit applications.

ANALOG CIRCUITS IN MEASUREMENT SYSTEMS (ANALOG SIGNAL CONDITIONING).

Voltage divider; Whetstone's bridge; Filters, low-pass and high-pass Filters; Operational Amplifiers; OpAmp circuit analysis; OpAmps in analog signal conditioning circuits.

DIGITAL CIRCUITS AND ITS USAGE IN MEASUREMENT SYSTEMS (DIGITAL SIGNAL CONDITIONING)

Digital signal and its properties. Sampling and hold of analog signals; Memory components, input and output components; Digital to Analog Converter (DAC), Analog to Digital (ADC). Data acquisition systems.

Demonstration of the syllabus coherence with curricular unit's objectives (max. 1000 characters)

The Curricular Unit Syllabus aims at delivering the knowledge about the working principles of the main electronic devices present in analog electronic circuits.

Also, the basic concepts in digital electronics are covered, allowing for the design and selection of simple circuits and providing an understanding of the analog-digital interface.

Teaching methodologies (including evaluation) (max. 1000 characters)

Oral lectures and problem solved during the lectures. Demonstrations of typical circuits' behavior in the laboratory. Assembly of circuits by the students. Discussions on symptoms and fault diagnosis of circuits in the laboratory.

The assessment in this course is carried out through a written exam and laboratory projects considered pedagogically fundamental.

The final score is given by: 70% written exam + 30% Laboratory projects

Demonstration of the teaching methodologies coherence with the curricular unit's objectives (max. 3000 characters)

The teaching methodologies allow students to achieve theoretical knowledge about the working principles of the main electronic devices present in analog electronic circuits. Through lectures and laboratory sessions students will develop the necessary skills to design and analyze analog and digital circuits.

Main Bibliography (max. 1000 characters)

Malvino, A. P., **Electronic Principles**. McGraw-Hill Higher Education; 8 ed., 2015.

Schrez, P., Monk, S., **Practical Electronics for Inventors**. Tab Electronics; 4 ed., 2016.

Tocci, R., Widmer, N., Moss, G., **Digital Systems: Principles and Applications**. Pearson; 11 ed., 2013.