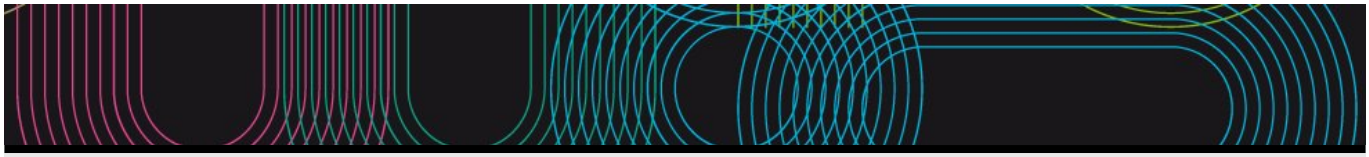

IDENTIFYING DATA				
Electronic instrumentation				
Subject	Electronic instrumentation			
Code	V12G340V01801			
Study programme	Degree in Industrial Organisation Engineering			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	3rd	2nd
Teaching language	Spanish Galician			
Department				
Coordinator	Eguizábal Gándara, Luis Eduardo			
Lecturers	Eguizábal Gándara, Luis Eduardo			
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General description	The Electronic Instrumentation is part of the electronic technology, mainly analog, that occupies of the measurement of any type of physical magnitude, of the conversion of the same the electrical magnitudes and of his treatment to provide the suitable information to a system of control, the a human operator or both. The instrumentation has two big subjects of work: - The study of the sensors and of his circuits of conditioning. - The study of the teams of instrumentation that employ for the measure of any type of physical variable. This matter frames inside the degree of Engineering in Industrial Organisation, that's why they will describe the most important appearances for this type titled. Between which fits to stand out: 1º) Sensors 2º) Circuits of conditioning of signal 3º) Systems of acquisition of data 4º) Systems of capture of data in plant 5º) Teams of *instrumentation 6º) Introduction to the Microcontrollers 7º) The pyramid of the automation. Control of the production and control of processes. 8º) Introduction to the Electronics of Power This matter has a marked practical character, approaching to the futures titled the capacity of selection of the technical solution more suitable, so much for the acquisition of physical variables, like the incorporation of the same in systems of business management, to do tasks of control of processes and control of the production.			

Competencies	
Code	
B3	CG 3. Knowledge in basic and technological subjects that will enable them to learn new methods and theories, and equip them with versatility to adapt to new situations.
C11	CE11 Knowledge of the fundamentals of electronics.
D2	CT2 Problems resolution.
D9	CT9 Apply knowledge.
D17	CT17 Working as a team.

Learning outcomes			
Expected results from this subject	Training and Learning Results		
Know the principles of operation of distinct type of sensors and his applications.	B3		
Know the general structure of a circuit of acondicionamiento	B3	C11	D2
Comprise the parameters of specification and design of electronic circuits of acondicionamiento of signal			D9
Know the structures of the system of acquisition of data	B3	C11	

Know and know use tools informáticas for the analysis, visualization and almacenamiento of the information supplied by the sensors.		D9 D17
Realize relative technical memories to the individual works or in group.	C11	

Contents	
Topic	
Subject 1: Introduction to the electronic instrumentation	Description of the blocks that form the structure of a system of control of an industrial process. Need of treatment of the signals that take part in the control of a process. Introduction to the systems of acquisition of data. Noise and distortion in the systems of measure.
Subject 2: Sensors	Definition, classification and study of the characteristics of operation. Criteria of selection.
Subject 3: Circuits of conditioning.	Amplification of signals. Filtered. Conversion A/D and D/A. Circuits S&H. Multiplexed of analog signals.
Subject 4: Systems of acquisition of data	Generalities. Basic elements. Typical configurations. Monolithic systems of acquisition of data. System of wireless acquisition.
Subject 5: Systems of instrumentation	Classification, Systems based in autonomous instruments. Modular instrumentation. Buses of instrumentation. Systems based in cards of acquisition of data. *Datalogger
Subject 6: Introduction to the control of processes based in the use of microcontrollers	Introduction to the control of processes Introduction to the microcontrollers Introduction to the actuators: hydraulic, tyres and electronic (Electronics of Power)
Subject 7: Integration of data of manufacture in systems of information	The pyramid of the automation. Systems SCADA, MES, ERP. Concept of control of the production and of the control of processes Captures of data for the control of the production: parts of work, bar codes. RFID.
Subject 8: Introduction to the Electronics of Power	Structure of a system of Electronic of Power. Devices of power. Applications. Types of conversion of the electrical energy
Practice 1: Circuits with operational amplifiers	Study of basic settings with operational amplifiers, linear settings and no linear
Practice 2: Introduction to the Virtual instrumentation. *LabVIEW.	*Familiarización With the surroundings and the execution of flow of data of *LabVIEW. Frontal signpost, diagrams of blocks. Description of the main types of data and structures of programming.
Practice 3: Application of the LabVIEW with hardware of commercial electronic instrumentation: Cards of Acquisition of Data (TAD) and datalogger	Description of the TAD NI 6008 and of the datalogger DT80. Example of application based in LabVIEW
Practice 4: System of acquisition of data for the measure of temperature	It will implement a system of acquisition of data for the conditioning of a sensor of temperature PT1000.
End of course work	- Implementation of a circuit of the measure and the control of a physical variable and his back acquisition by means of distinct hardware of capture. - Incorporate the information captures in a system of business management, to make tasks of control of production and control of processes.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	24	14	38
Problem solving	8	16	24
Laboratory practical	10	10	20
Presentation	2	8	10
Mentored work	6	30	36
Objective questions exam	1	8	9
Essay questions exam	3	10	13
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Lecturing	Exhibition by part of the professor of the contents of the subject object of study. The student, by means of autonomous work, will have to learn the concepts entered in the classroom and prepare the subjects on the bibliography proposed. They will identify possible doubts

Problem solving	Complementary activity of the sessions magistrales in which formulate problems and/or exercises related with the asignatura. The student will have to develop the felicitous solutions of the problems and/or exercises proposed in the classroom and of other extracted of the bibliography. They will identify possible doubts that will resolve in the classroom or in tutorías personalizadas.
Laboratory practical	Activities of application of the theoretical knowledges purchased. The student will exercise the basic skills related with the handle of the instrumentation of a laboratory of electronic instrumentation, the utilization of the tools of programming and the montaje of circuits proposed. The student will purchase skills of personal work and in group for the preparation of the works of laboratory, using the available documentation and the theoretical concepts related. They will identify possible doubts that will resolve in the laboratory or in tutorías personalizadas.
Presentation	Once evaluated the supervised works , it will select the most interesting and will propose to the students, the exhibition of said works to all the kind.
Mentored work	In the laboratory classes will pose a series of works to realize in group, that will develop with the teams of available instrumentation in the laboratory. They will identify possible doubts that will resolve in the laboratory or in personalized tutorials.

Personalized assistance

Methodologies	Description
Mentored work	In the laboratory classes and in tutorials will resolve personally each one of the doubts that show up in the realization of the works.
Presentation	The teacher will provide to the students of the necessary tools for the presentation of the suprvised works. They will resolve individually the doubts that can show up.

Assessment

	Description	Qualification	Training and Learning Results	
Laboratory practical	The practices of laboratory will evaluate of continuous form (session to session). The criteria of evaluation are: - minimum Assistance of 80% - Puntualidad - previous Preparation of the tasks. The sessions of practices will realize in groups of two students. To the finalizar each one of the sessions of practices, the students will owe to present a leaf of results, this and the work realized will serve like elements of evaluation.	5		D2 D9 D17
Presentation	The best works tutelados will be presented to the professor and if development of the practical kinds allows it, to all the kind.	5		D9
Mentored work	Once realized the work tutelado, the students will owe to elaborate a memory descriptiva. It will fix a day for the delivery of the memory and the presentation of the work realized. This note will form part of the continuous evaluation.	30		D2 D9 D17
Objective questions exam	To the finalizar the cuatrimestre will realize a proof written of type test, in the date indicated by the centre.	10	C11	
Essay questions exam	In the dates indicated by the calendar of examinations of the centre, will realize the final proofs that will consist in questions of theory and problems of development.	50	B3	D2 D9 D17

Other comments on the Evaluation

The proofs of long answer and the types test, will realize in the dates fixed by the centre and will represent 60% of the final note. 40% restante will correspond to the note obtained along the course, by means of continuous evaluation, of the practices of laboratory and of the works tutelados. In each one of these evaluations exigirá a minimum note of 30%.

The students to which the direction of the centre recognize them his renuncia to the continuous evaluation, will owe to present to the final proof. This will represent a 60% of the note, 40% restante will obtain by means of an examination of practices and the realization of a work. In this case, the examination of practices and the work will have compulsory character, and in said proofs will have to obtain a minimum note of 50%.

In the second announcement will proceed of the same form.

The note of practice only saved an academic course.

Expect that the present student an ethical behaviour felicitous. In case to detect a no ethical behaviour (copy, plagio,

utilization of electronic devices no authorized, for example), will consider that the student does not gather the necessary requirements to surpass the subject. Depending of the type of behaviour no ethical detected, could conclude that the student has not achieved the competitions B2, B3 and CT19. In this case the global qualification in the present academic course will be of suspenso (0.0).

It will not allow the utilization of any electronic device during the proofs of evaluation except autorización expresses. The fact to enter an electronic device no authorized in the classroom of the examination, will be considered reason of no superación of the present subject in the present academic course and the global qualification will be of suspenso (0.0).

THE ACQUISITION OF THE COMPETITIONS And HIS INFLUENCE IN THE EVALUATION

In this asignatura there is not a planteamiento of evaluation by competitions. To continuation specify like the distinct activities docentes exercise to the student in the distinct competitions and like the acquisition of the same condition the final qualification obtained by elalumno.

CG3. Knowledge enmaterias basic and technological, that them capacite for the learning of new methods and theories and them dowry of versatilidad to adapt to new situations.

The acquisition of this competition is guaranteeed (in elámbito of the asignatura) by the proper contents of the same. On these contents of technological character versan the activities of autoevaluación, the practices and the distinct proofs of evaluation

CE11. Knowledges delos fundamentos of the electronic.

CE30. Knowledge of the fundamentos and applications of laelectrónica analógica.

Also the acquisition of these competitions is guaranteeed by the contents of the asignatura, pues on these fundamental contents of the electronic versan the practices and the distinct proofs of evaluation.

CE 31. Knowledge applied of electronic instrumentation. So much in the kinds of theory and problems, as in the practices of laboratory, realize a group of activity that have like main objective the cumplimento of this competition. Likewise, the activities of evaluation of the subject have like finalidad the measure of the capacity achieved by the alumnado in this competition.

CT2. Resolution of problems.

The students exercise in this competition by means of the activities proposed: bulletins of problems and theoretical resolution of the montajes proposed in the billed of practices. The acquisition of the competition in the field of the asignatura, is justified by the fact that the proofs of evaluation (thematic block and individual proof), consist almost in his whole in the resolution of problems.

CT3 oral Communication and written of knowledges in proper tongue.

This competition achieve and evaluate in the works of laboratory proposed. These realize in groups of two and to the finalizar the same, each group will owe to deliver a memory written of the activities realized. The students that elaborate the best works will have to realize an oral presentation.

CT9. Apply knowledges.

The students exercise this competition, especially in the sessions of laboratory, in where have to move to the simulaciones and to the montaje and real measures the studied in the theoretical sessions. The sessions of laboratory are evaluated a to one, promediándose the final note always and when there is an assistance and aprovechamiento minimum.

CT17 Work in team.

The students exercise this competition in the sessions of laboratory, pues said sessions realize in teams of two. The collaboration between both students is necessary to carry out successfully the montajes, the measures and take of data required in each experiment. The professor of practices verifica that the previous preparation and development of each one of the sessions was the result of the collaboration of the two members of each group. In case to detect anomalies in this sense, the qualifications of each member of the group remain penalizadas and individualizadas.

Sources of information

Basic Bibliography

Pérez García, M.A, **Instrumentación Electrónica**, 2ª ed.,

Franco, S., **Diseño con amplificadores operacionales y circuitos integrados analógicos**, 3ª ed.,

Pérez García, M.A., **Instrumentación Electrónica: 230 problemas resueltos**, 1ª ed.,

del Río Fernández, J., **LabVIEW: Programación para Sistemas de Instrumentación**, 1ª ed.,
Robert Faludi, **Bulding wireless sensor network**,
Godinez González, L., **RFID: oportunidades y riesgos, su aplicación practica**,
Pallás Areny, R., **Sensores y Acondicionadores de Seña**, 4ª ed.,

Complementary Bibliography

Antonio Rodríguez Mata, **Sistemas de Medida y Regulación**, 2ª ed, 2004
Carson Chen, **Active filter design**,
Paul Bildtein, **Filtros Activos**,
S.A. Pactitis, **Active filters. Theory and design.**,
Daniel W. Hart, **Electrónica de Potencia**,

Recommendations

Subjects that continue the syllabus

Manufacturing technologies and systems/V12G340V01701
Advanced programming for engineering/V12G340V01906
Information systems and integrated management systems/V12G340V01914

Subjects that are recommended to be taken simultaneously

Operations management/V12G340V01601

Subjects that it is recommended to have taken before

Computer science: Computing for engineering/V12G340V01203
Mathematics: Calculus 1/V12G340V01104
Automation and control fundamentals/V12G340V01403
Fundamentals of electrical engineering/V12G340V01303
Electronic technology/V12G340V01402