



IDENTIFYING DATA

Fundamentals of electronics for biomedicine

Subject	Fundamentals of electronics for biomedicine			
Code	V12G420V01401			
Study programme	Grado en Ingeniería Biomédica			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	2nd
Teaching language	Spanish Galician			
Department				
Coordinator	Raña García, Herminio José			
Lecturers	Raña García, Herminio José			
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General description	This *asignatura pretends to provide to the *alumnado a basic training, so much theoretical how practical, on the fundamental concepts of the analog electronics.			

Skills

Code	
B3	CG3 Knowledge in basic and technological subjects that will enable students to learn new methods and theories, and provide them the versatility to adapt to new situations.
C11	CE11 Knowledge of the fundamentals of electronics.
D2	CT2 Problems resolution.
D9	CT9 Apply knowledge.
D10	CT10 Self learning and work.

Learning outcomes

Expected results from this subject	Training and Learning Results		
New	B3	C11	D2 D9
New	B3	C11	D2 D9
New			D2 D9 D10
New			D2 D9 D10
New			D9 D10
New	B3		D2 D9 D10
New			D9 D10

Contents

Topic

Subject 1. Physics of devices.	Fundamental concepts. Introduction to physics of the solid state. Union *PN: balance, direct polarisation, reverse polarisation. Differences between ideal diode and real diode. Models of the diode. I handle of the characteristic leaves. Types of diodes.
Subject 3. Transistors.	Bipolar transistor (*BJT). Transistors of effect field (*JFET and *MOSFET). Models.
Subject 4. Amplification.	Concepts, parameters, classification. Circuits of polarisation. Models in small signal of the transistors. Frequency response.
Subject 5. Binary system and algebra of *Boole	Systems of numbering. Binary codes. Algebra of *Boole. Logical doors and logical functions. Technologies and logical families.
Subject 6. Systems *combinacionales	Synthesis of functions *combinacionales. Design of circuits *combinacionales. Blocks *combinacionales *MSI
Subject 7. Sequential systems	Introduction and classification. *Biestables. Asynchronous sequential systems. Synchronous sequential systems. Blocks *MSI: Counters. Registers of trip. Design of sequential circuits. Memories and concept of microcontroller.
Subject 8. Analog conversion-digital-analog (*CAD/*CDA).	Analog signals and digital signals. The digital analog converter (*CAD). Sampling, quantification and digitalisation. Characteristics more notable: number of bits, speed, rank of conversion and cost The analog digital converter (*CDA). Foundations of sensors.

Planning

	Class hours	Hours outside the classroom	Total hours
Introductory activities	0	1	1
Case studies	0	15	15
Lecturing	23	0	23
Problem solving	15	29	44
Autonomous problem solving	0	27	27
Previous studies	0	20	20
Laboratory practical	15	0	15
Essay questions exam	3	0	3

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Introductory activities	Con antelación al inicio de las sesiones presenciales estará la disposición de los alumnos un listado detallado de conocimientos que deben de adquirir a lo largo de su formación previa y que le serán necesarios para afrontar la materia con éxito.
Case studies	Con antelación a la realización de las sesiones teóricas, los alumnos dispondrán de una serie de materias que han de preparar, pues sobre ellos versarán dichas sesiones.
Lecturing	Se desarrollarán en los horarios fijados por la dirección del centro. Consistirán en una exposición por parte del profesor de aspectos relevantes de la materia que estarán relacionados con las materias que previamente debió trabajar el alumno. De este modo se propicia la participación activa del mismo, que tendrá ocasión de exponer dudas y preguntas durante la sesión. En la medida en que el tamaño de los grupos lo permita se propiciará una participación lo más activa posible del alumno.
Problem solving	Durante las sesiones de aula, cuando resulte oportuno o relevante se procederá a la resolución de ejemplos y/o problemas que ilustren adecuadamente la problemática a tratar.

Autonomous problem solving	Después de cada sesión teórica de aula el alumno debería realizar, de forma sistemática un estudio de consolidación y repaso donde deberían quedar resueltas todas sus dudas con respecto a la materia. Las dudas o aspectos no resueltos deberá exponerlos al profesor a la mayor brevedad, a fin de que este utilice estas dudas o cuestiones como elemento de realimentación del proceso de enseñanza-aprendizaje.
Previous studies	Es absolutamente imprescindible que, para un correcto aprovechamiento, el alumno realice una preparación previa de las sesiones prácticas de laboratorio, para eso se le suministrará indicaciones y material específico para cada sesión con antelación suficiente. El alumno deberá trabajar previamente sobre el material suministrado y también debe tener preparados los aspectos teóricos necesarios para abordar la sesión. Esta preparación previa será un elemento que se tendrá muy en cuenta a la hora de evaluar cada sesión práctica.
Laboratory practical	Durante las sesiones de prácticas los alumnos realizarán actividades del siguiente tipo: <ul style="list-style-type: none"> - Montaje de circuitos. - Manejo de instrumentación electrónica - Medidas sobre circuitos - Cálculos relativos al montaje y/o medidas de comprobación - Recopilación y representación de datos Al final de cada sesión de prácticas cada grupo entregará las hojas de resultados correspondientes.

Personalized assistance

Methodologies	Description
Laboratory practical	In the sessions of laboratory will make a follow-up *particularizado of the doubts and incidences to level of group of work.

Assessment

	Description	Qualification	Training and Learning Results		
Laboratory practical	The practices of laboratory will evaluate of continuous way (session to session). The criteria of evaluation are: <ul style="list-style-type: none"> - A minimum assistance of 80%. - *Puntualidad. - Previous preparation of the practices. - *Aprovechamiento Of the session. - The practical sessions will realise in groups of two students. The billed of the practices will be the disposal of the students with *antelación. - The students answered in a group of leaves the results, that will deliver to the ending of the practice. These leaves will serve to justify the assistance and value the *aprovechamiento. 	20	C11	D10	
Essay questions exam	It will consist in a proof written of individual and face-to-face character that will realise when finalising the *cuatrimestre, in the schedules established by the direction of the centre. The proof will be able to consist in a combination of the following types of exercises: <ul style="list-style-type: none"> - you Question type test. - Questions of short answer. - Problems of analysis. - Resolution of practical cases. 	80	B3	C11	D2 D9

Other comments on the Evaluation

To surpass the subject, the student has to obtain 5 points on 10.

Recommendations: The students *podrÃn consult any relative doubt to the activities assigned to the group of work to the that belong or the matter seen in the face-to-face hours in the hours of tutorÃce or to *travÃs of the means related in the section of *AtenciÃn to the student. The students have to fulfil *inexcusablemente the terms established for the different activities. In the different proofs advises to the students that justify all the results that reach. To the hour to mark them no giveÃ ningÃn resulted by *sobrentendido and *tendrÃ in account the *mÃall employed to arrive to the *soluciÃn proposal. It recommends , in the *presentaciÃn of the diverse exercises, not presenting faults of *ortografÃto and characters or *sÃmbolos unreadable, because affectÃn to the *puntuaciÃn final. During the *realizaciÃn of the proofs no *podrÃ use aim and the *telÃfonos *mÃvile have toÃn be turned off and, only in the case that authorise previously, *podrÃn use aim or another material of support. Guidelines for the improvement and the *recuperaciÃn: In case that a student do not approve the matter in the first announcement, has of a second announcement in the present course *acadÃmico. The *calificaciÃn corresponding final for this second announcement *obtendrÃ like result to add the following notes: 1.- The note obtained in the *evaluaciÃn of the *prÃcticas of laboratory in the first announcement, with a weight of 20% of the *calificaciÃn final. 2.- The note obtained in the *evaluaciÃn of

the proof written of *carÃcter individual and face-to-face. The proof evaluateÃ contained of all the subject. The weight of this note is of 80% of the *calificaciÃ final. To approve the matter in this second announcement is necessary to obtain a *puntuaciÃ equal or upper final to 5 points.

Once #finish the present course *acadÃmico. The notes obtained in the evaluations of the blocks *temÃticos and the note obtained in the *evaluaciÃ of the final examination lose his validity. The notes obtained in the evaluations of *prÃcticas *mantendrÃ during the two courses *acadÃmicos following to the present course, except that the student wish to do them again.

*EvaluaciÃ Of students with renunciation to the *evaluaciÃ continued: The students that was them conceded, of official form by the centre, the renunciation to the *evaluaciÃ continued, *tendrÃ that make a proof written similar to the proof *individualizada of long answer and a proof *prÃctica of laboratory. Both proofs *tendrÃ a *puntuaciÃ *mÃxima of 10 points. The final note beÃ the average of the notes of the two proofs. To surpass the subject *tendrÃ that obtain an equal or upper note to 5 points. The proof written makeÃ when finalising the *cuatrimestre, in the schedules established by the *direcciÃ of the centre. The proof *prÃctica in a near date to the previous and that *propondrÃ in *funciÃ of the availability of the laboratories. Commitment Ãtico: it expects that the present student a behaviour Ãtico suitable. In the case to detect a behaviour no Ãtico (copy, plagiarism, *utilizaciÃ of devices *electrÃnicos unauthorised, and others) considerÃ that the student no *reÃne the necessary requirements to surpass the matter. In this case the *calificaciÃ global in the present course *acadÃmico beÃ of suspense (0.0).

Sources of information

Basic Bibliography

Malik N.R., **Circuitos Electrónicos. Análisis, simulación y diseño**, Prentice-Hall, 1996

Malvino, A; Bates, D., **Principios de Electrónica**, 7º, McGraw-Hill, 2007

Rashid, M.H., **Circuitos microelectrónicos. Análisis y diseño**, Thomson, 2002

Complementary Bibliography

Pleite Guerra, J., Vergaz Benito, R., Ruíz de Marcos, J.M., **Electrónica analógica para ingenieros**, McGraw-Hill, 2009

Hambley, A.R., **Electrónica**, Prentice-Hall,, 2001

Boylestad, R.L., Nashelsky, L., **Electrónica: Teoría de circuitos y dispositivos electrónicos**, Prentice-Hall, 2009

Millmann, J, **Microelectrónica. Circuitos y sistemas analógicos y digitales**, Hispano Europea, 1988

Coughlin, R.F., Driscoll, F.F, **Amplificadores operacionales y circuitos integrados lineales**, Prentice-Hall, 1999

Recommendations

Subjects that it is recommended to have taken before

Physics: Physics I/V12G420V01102

Physics: physics II/V12G420V01202

Computer Science: computer science for engineering/V12G420V01203

Mathematics: calculus I/V12G420V01104

Mathematics: calculus II and differential equations/V12G420V01204

Fundamentals of electrotechnology/V12G420V01305

Contingency plan

Description

=== EXCEPTIONAL MEASURES SCHEDULED ===

In front of the uncertain and unpredictable evolution of the sanitary alert caused by the *COVID-19, the University of Vigo establishes an extraordinary planning that will activate in the moment in that the administrations and the own institution determine it attending to criteria of security, health and responsibility, and guaranteeing the teaching in a no face-to-face stage or partially face-to-face. These already scheduled measures guarantee, in the moment that was prescriptive, the development of the teaching of a more agile and effective way when being known in advance (or with a wide *antelación) by the students and the *profesorado through the tool normalised and institutionalised of the educational guides.

=== ADAPTATION OF THE METHODOLOGIES ===

will try that the degree of *presencialidad in the educational activities was the maximum that guarantee the security and health of all the parts involved. In any case will follow the guidelines in instructions indicated by the direction of the centre. In the case that it give a situation in that the educational activities can not be face-to-face will not see affected neither the contents neither the results of learning contemplated in the subject. With such end will make the following adaptations.

Sessions of theory: Teaching in the remote classrooms or any another half enabled by the university.

Sessions of laboratory: Teaching in the remote classrooms or any another half

enabled by the university. They will use preferably tools of simulation.

*Tutorías: It will use preferably the email and, if it was necessary, the videoconference.

Evaluation: they will make by telematic means. The number of proofs of evaluation will not modify , neither will modify the relative weight of each one of them in the qualification of the subject.
