



Universidad de Jaén

School of Engineering of Linares

Circuits for electronic instrumentation

2024-2025

Máster Universitario en Ingeniería de Telecomunicación



GRATIS



Acceso Mayores 40

Guías docentes UJA

Horarios de tutorías

Llamamientos PAU

Movilidad (Coordinador)

P.O.D.

Solicitud bilingüismo

Syllabus 2024-25 - 74212005 - Circuits for Electronic Instrumentation (Circuitos de instrumentación electrónica)

Caption

- Level 1: Tutorial support sessions, materials and exams in this language
- Level 2: Tutorial support sessions, materials, exams and seminars in this language
- Level 3: Tutorial support sessions, materials, exams, seminars and regular lectures in this language

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DEGREE:

Máster en Ingeniería de Telecomunicación

FACULTY:

SCHOOL OF ENGINEERING OF LINARES

ACADEMIC YEAR:

2024-25

COURSE:

Circuits for Electronic Instrumentation

SYLLABUS

1. COURSE BASIC INFORMATION

NAME: Circuits for Electronic Instrumentation

CODE: 74212005

ACADEMIC YEAR: 2024-25

LANGUAGE: English

LEVEL: 3

ECTS CREDITS: 6.0

YEAR: 1

SEMESTER: PC

2. LECTURER BASIC INFORMATION

NAME: MUÑOZ DÍEZ, JOSÉ VICENTE

DEPARTMENT: U133 - ING. ELECTRÓNICA Y AUTOMÁTICA

FIELD OF STUDY: 785 - TECNOLOGÍA ELECTRÓNICA

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LANGUAGE: English

LEVEL: 3

3. CONTENT DESCRIPTION

Chapter 1. Introduction

Definitions. Technical evolution of IC. Integration Scales. Manufacturing processes of IC. Signals and variables. Measuring systems. Static/dynamic characteristics. CAD Tools.

Chapter 2. Bipolar Junction Transistor

Introduction. DC response review. Basic biasing configurations. AC response review. Basic amplifying configurations.

Practical seminar. First laboratory contact: Light Detector

Chapter 3. Mosfet Transistor

Introduction. MOSFET. The physics of operation. DC response of the MOSFET. AC response of the MOSFET. Biasing MOSFET Circuits. Current sources. Amplification stages based on MOSFET.

Practical session 1: Twilight switch with timer

Chapter 4. Real Operational Amplifier

Operational amplifier a key device in electronics. Internal schematic: three basic stages. Ideal response of the operational amplifier. on-idealities of the operational amplifier. Offset voltage. Bias current. Offset current. Common mode voltage range. Common mode rejection ratio. Gain and Bandwidth. Input and output impedance. Slew-rate.

Practical session 2: Operational amplifier application

Chapter 5. Introduction to measurement systems.

Overall schematic of an instrumentation system. Sensors and transducers. Signal conditioning. Analog to digital converters. Static and dynamic features of instrumentation systems. Acquisition, analysis, and data storage using LabView. Errors and uncertainty analysis.

Practical seminar: Introduction to Labview

Practical session 3: LabVIEW. Flow program control structures : Calculator

Chapter 6. Sensors and Basic Conditioning Systems Using Operational Amplifiers

Open loop. Comparator. Positive and negative feedback. Positive feedback: Schmitt trigger. Negative feedback: series-parallel configuration. Main amplification configurations for instrumentation: differential amplifier and Instrumentation amplifier. Voltage sensors output: types and recommendations. Sensing high voltage: voltage divider and isolation amplifier. Conditioning circuits for resistive sensors: voltage divider and Wheatstone bridge. Band-gap voltage references. Other resistive sensors and conditioning circuits. Sensing current: shunt resistor and Hall effect sensor

Practical session 4: LabVIEW. Temperature acquisition and control by myDAQ.

Practical session 5: Third parties hardware. Controlling the Arduino UNO by LabVIEW.

Practical session 6: Uncertainty study with multimeter RIGOL DM3058E

Chapter 7. Electronic drivers and actuators

Measurement systems and control. Electronic drivers and actuators. Electronic devices to control DC loads. BJT transistor. MOSFET transistor. IGBT transistor. Optocoupler. Electronic devices to control AC loads. Thyristor (SCR). Triac. Optotriac (MOC). Electromechanical switching device: Relay. Solid state relay (SSR)

Practical session 7: AC switching device based on a TRIAC for Arduino UNO.

4. COURSE DESCRIPTION AND TEACHING METHODOLOGY

The methodology followed in this subject are based on four main points:

- 1) Lessons and seminars. It means master lectures delivered by the professor where the active participation of the students is going to be boosted.
- 2) Practical lessons. These lessons will be delivered in the laboratory in groups where the maximum number of student per group will not be more than 20 people. These lessons will allow to put in practice the concepts which will be describe through the theoretical lessons.
- 3) Presentations by the students in class. The students will expose their works about some topics which it will be proposed by the professor.
- 4) Tutorial sessions in group or individual. This activity will allow to give a more personal answer to the doubts that the students will have along the academic year.

The development of large group and small group lectures will be focused on promoting quality teaching by giving priority to activities that foster inclusive and equitable learning (SDG-4)

Students with special educational needs should contact the Student Attention Service (Servicio de Atención y Ayudas al Estudiante) in order to receive the appropriate academic support

5. ASSESSMENT METHODOLOGY

The evaluation of the subject is based on four points:

- 1) Attendance and active participation in lectures. This point will represent 5% of the final mark.
- 2) Problems resolution and/or presentations in class. This point will represent 25% of the final mark. The problems will have to be solved and given for its correction by the professor. The presentations will consist in a hour of speech of a proposed topic by the professor.
- 3) Design and implementation of electronic circuits in practical sessions. This point will represent the 35% of the final mark. There will be practical sessions which are going to be corrected in the laboratory and other ones which will be necessary to prepare a final report.
- 4) Written exam. This point will represent 35% of the final mark. **It is mandatory to obtain at the very least a minimum mark of 3.5 to pass the subject.**

Relevant information for extra session exam (July)

The mark for S4 (practical sessions) in the extra exam session will be assessed by a practical exam, if any. Nevertheless, a mark up to 4 in S2 (written exam) will be necessary to proceed to the computation of the overall mark (computing as the average of the available ones). The weights will be also modified due to the fact that S1 mark is not applicable in the extra exam session, so only S2 (60%) and S4 (40%) will be computed. The student will pass the course in case they get a overall mark in exceed of 5.

The first point described above is aimed to evaluate the progress of the students in order to achieve the competences CB6, CG1, CG2, CG3, CT1 and CT5. Moreover, the following results of the learning are also evaluated by this activity: Resul-16 and Result-17.

The second point described above is aimed to evaluate the progress of the students in order to achieve the competences CB6, CE12, CG5 and CT1. Moreover, the following results of the learning are also evaluated by this activity: Resul-16, Resul-17, Resul-18 and Result-19.

The third point described above is aimed to evaluate the progress of the students in order to achieve the competences CB6, CE10, CE11, CE12, CE13, CE14, CG4, CG5 and CT2. Moreover, the following results of the learning are also evaluated by this activity: Resul-16, Resul-17, Resul-19 and Result-20.

The fourth point described above is aimed to evaluate the progress of the students in order to achieve the competences CB7, CE10, CE12, CG4, CG5 and CT1. Moreover, the following results of the learning are also evaluated by this activity: Resul-18, Resul-19 and Resul-20.

6. BOOKLIST ([Access the bibliography in the Library catalog](#))

MAIN BOOKLIST:

- LabVIEW for everyone [Recurso electrónico] : graphical programming made easy and fun . Edition: -. Author: Travis, Jeffrey. Publisher: Upper Saddle River, N.J. : Prentice Hall, 2006..
 - **Notes:** Suitable for practical sessions
([Library](#))
- Instrumentation reference book [Recurso electrónico]. Edition: 4th ed.. Author: -. Publisher: Amsterdam ; Boston : Butterworth-Heinemann Elsevier, c2010..
 - **Notes:** Suitable for theoretical lectures
([Library](#))
- Microelectronics circuits. Edition: -. Author: Sedra, Adel S.. Publisher: New York ; Oxford: Oxford University Press, 2004.
 - **Notes:** Suitable for theoretical lessons and problems resolution
([Library](#))
- Microelectronic circuits : analysis and design. Edition: 2nd ed., [ed. international]. Author: Rashid, M.H. Publisher: Belmont (CA) : Cengage Learning, cop. 2011.
 - **Notes:** Suitable for theoretical lessons and problems resolutions
([Library](#))
- CMOS analog circuit design. Edition: 2nd ed.. Author: Allen, Phillip E.. Publisher: New York, Oxford : Oxford University Press, 2002.
 - **Notes:** Suitable for theoretical lessons
([Library](#))

7. SUSTAINABLE DEVELOPMENT GOALS

Educación de calidad

Industria, innovación e infraestructura

Producción y consumo responsables

Acción por el clima

DETAILED INFORMATION

Goal 4. Quality education

Throughout all the activities of the subject, fundamental aspects in relation to inclusion and equity will be addressed, which will also be part of the evaluation of the participation aspects. Thus, it will be promoted, both in large group expository classes, as well as in small groups, to use inclusive language both at the written and oral level and to attend to activities of various kinds focused on being equitable with the different learning capacities of the student. Furthermore, on the one hand, in large group classes the ability to collect and interpret data and handle complex concepts in the field of [telecommunications] will be developed and enhanced, to make judgments that involve reflection on ethical and social issues. On the other hand, in small group classes special emphasis will be placed on the need for continuous training and undertaking this activity independently throughout one's professional life, as well as the ability to stay up to date with new developments. in the field of [telecommunications], taking a more technical approach.

Goal 9: Build resilient infrastructure, promote sustainable

industrialization and foster innovation

Through the activities of this subject in large and small group classes, special emphasis is placed on the fact that [telecommunication] systems and services must be developed, implemented and maintained in a way that achieves resilient and robust industrialization, as well as as sustainable.

Furthermore, both with the training of content, abilities, skills and abilities, and with the development of the activities proposed to the students, personal initiative and the ability to solve problems autonomously are promoted in order to encourage innovation as a driving force for industrial development, especially in the field of [telecommunications], as well as a wealth-generating element of a society.

Goal 12: Ensure sustainable consumption and production patterns

In this subject, through the activities designed for large and small group classes, we will seek to raise awareness among students about the reasonable use of resources, given that [telecommunication services/industrial activity] are generally very demanding in energy and raw materials, and likewise in the search for greater durability of products and services, pursuing a longer-term use of the resources used. Therefore, emphasis will be placed on achieving robust, efficient, long-lasting services and/or products with the lowest possible environmental impact, always taking into account the techniques that facilitate this, such as the correct specification of needs, designs that use new, clean and advanced technologies, carrying out tests and using, as far as possible, renewable energies.

Goal 13: Take urgent action to combat climate change and its impacts

Given that climate change poses a certain threat to human activities and by extension to all life on Earth, in the development of the activities of this subject, it will be taken into account

that [telecommunication services/industrial activity], which are in continuous development and expansion, their impact on the environment must always be observed, given that they not only demand energy, but also use, in many cases, raw materials whose extraction involves the deterioration of the ecosystems. Therefore, emphasis will be placed on the services and/or products that are developed having the least possible impact on the environment, through the application, for example, of renewable sources, recycling of materials, and more robust, efficient and durable designs. In this way, it would be possible to reduce the current rate of environmental deterioration.

8. VIRTUAL / CLASSROOM TEACHING SCENARIO

Due to the short number of students usually enrolled in the master the lessons for all the students will take place in the indicated classroom. So, any access restriction restriction will be applied.

9. VIRTUAL TEACHING SCENARIO

Teaching Activities and Methodologies

Teaching activities	Format	Methodologies
Theoretical lectures for all the students which will last 1 hour	Online and synchronous	Online Masterclass
Practical sessions for all the students in laboratory which will last 2 hours	Online and synchronous	Online practical sessions which will include seminars and simulations tools for electronic circuits
Tutorial lectures	Online	By any available online platform

Assessment

OVERALL ASSESSMENT			
Kind of test	Tool	Description	Weigth
S1. Active participation in lectures and tutorials. - Active participation in lab work. -Attendance to individual tutorial and activities.	Observation and problems resolution	-Active participation in lectures and tutorials. - Active participation in lab oratory work. -Attendance to individual tutorial and activities.	10 %
S2. Practical and theoretical assimilation of subject concepts.	Practical and theoretical assimilation of subject concepts.	Online written exam according to the official schedule	50 %
S4. Design and implementation of electronic circuits	Designing and simulation of the proposed practical examples	-Documentation delivered. The revision for each document includes: -Structure - Quality - Novelty - Clarity of presentation	4 0 %
The mark for S4 in the extra exam session will be assessed by a practical exam if any . Nevertheless, a mark up to 4 in S2 will be necessary to proceed to the computation of the overall mark (computing as the average of the available ones). The weigths will be modified due to the fact that S1 mark is not applicable in the extra exam session, so only S2 (60%) and S4 (40%) will be computed. The student will pass the course in case they get a overall mark in exceed of 5.			

Single Exam*			
Test	Tool	Description	Weight
S2. Practical and theoretical assimilation of subject concepts.	Practical and theoretical assimilation of subject concepts.	Online written exam	50%
S4. Design and implementation of electronic circuits	Designing and simulation of the proposed practical examples	-Documentation delivered. The revision for each document includes: -Structure - Quality - Novelty - Clarity of presentation	50%
At the very least a mark of 3.5 in S2 and S4 will be needed to compute the overall mark. The student will pass the course in case they get a overall mark in exceed of 5.			

* According to the article 13 th of the Official Academic Guideline for the assessment of the Students at the University of Jaen whoever student has the right to ask for this exam as long as they justify the reason why they can not take part in regular teaching activities. They must let the professor know about it a week in advance the beginning of the exam period.

Resources

The communication means will be profoundly modified under this scenario. Thus, the following resources will be used:

Video call on Google Meet o whatever similar platform .

Virtual blackboard by Google Jamboard o r similar.

Resources available on ILIAS platform .

DATA PROTECTION CLAUSE (on line exams)

Institution in charge of data processing: Universidad de Jaén, Campus Las Lagunillas, s/n, 23071 Jaén

Data Protection Delegate: dpo@ujaen.es

Purpose: In accordance with the Universities Law and other national and regional regulations in force, carrying out exams and assessment tests corresponding to the courses students are registered in. In order to avoid frauds while sitting the exam, the exam will be answered using a videoconference system, being able the academic staff of the University of Jaén to compare and contrast the image of the person who is answering the exam with the student's photographic files. Likewise, in order to provide the exam with evidential content for revisions or claims, in accordance with current regulation frameworks, the exam will be recorded and stored.

Legitimacy: compliance with legal obligations (Universities Law) and other national and regional regulations currently in force.

Addressees: service providers who are the owners of the platforms where the exams are carried out and with whom the University of Jaén has signed the corresponding data access contracts.

Storage periods: those established in current in force regulations. In the specific case of exam videoconference recordings, not before the examination records and transcripts are closed or the exam can still be reviewed or challenged.

Rights: you can exercise your right of access, amendment, cancellation, opposition, suppression, limitation and portability by sending a letter to the postal or electronic address indicated above. In the event that you consider that your rights have been violated, you may submit a complaint to the Andalusian Council for Transparency and Data Protection www.ctpdandalucia.es

CLASS RECORDING CLAUSE PERSONAL DATA PROTECTION

Person in charge: Universidad de Jaén, Paraje Las Lagunillas, s/n; Tel.953 212121; www.ujaen.es

Data protection delegate (DPO): TELEFÓNICA, S.A.U. ; Email: dpo@ujaen.es

Procedure aim: To manage proper recordings of teaching sessions with the aim of facilitating learning process under a multimodal and/or online teaching

Period for record storage: Images will be kept during legal term according to regulations in force

Legitimacy: Data will be managed according to legal regulations (Organic Law 6/2001, December 21, on Universities) and given consent provided by selecting corresponding box in legal admission documents

Data recipients (transfers or assignments): Any person allowed to get access to every teaching modality

Rights: You may exercise your rights of access, rectification, cancellation, portability, limitation of processing, deletion or, where appropriate, opposition. To exercise these rights, you must submit a written request to the Information, Registration and Electronic Administration Service of the University of Jaen at the address above, or by e-mail to the address above. You must specify which of these rights you are requesting to be satisfied and, at the same time, you must attach a photocopy of your ID card or equivalent identification document. In case you act through a representative, legal or voluntary, you must also provide a document that proves this representation and identification. Likewise, if you consider that your right to personal data protection has been violated, you may file a complaint with the Andalusian Data Protection and Transparency Council www.ctpdandalucia.es

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