**Goi Eskola Politeknikoa | Mondragon Unibertsitatea**
Course: 2023 / 2024 - Course planning

# [GIG301] DIGITAL ELECTRONIC SYSTEMS

## GENERAL INFORMATION

| | | | |
|---|---|---|---|
| **Studies** | DEGREE IN COMPUTER ENGINEERING | **Subject** | COMPUTER ENGINEERING |
| **Semester** | 2 | **Course** 1 | |
| **Character** | BASIC TRAINING | **Mention / Field of specialisation** | |
| **Plan** | 2022 | **Modality** Face-to-face | **Language** EUSKARA |
| **Credits** | 6 | **Hours/week** 5.44 | **Total hours** 98 class hours + 52 non-class hours = **150 total hours** |

## PROFESSORS

ANTIA JUARISTI, ANE

MARTINEZ DE MENDIVIL VARAS, JON

## REQUIRED PREVIOUS KNOWLEDGE

| **Subjects** | **Knowledge** |
|---|---|
| *(No specific previous subjects required)* | *(No previous knowledge required)* |

## LEARNING RESULTS

| LEARNING RESULTS | KC | SK | AB | ECTS |
|---|---|---|---|---|
| **GIR104** - To know the fundamentals of semiconductors, logic families and electronic devices and design and build digital systems to solve engineering problems. | | x | | 5,4 |
| **G-RTR1** - To develop interdisciplinary projects specific to their specialty and of gradual complexity, - becoming aware of respect for human rights and fundamental rights, and analyzing and assessing the impact of the proposed solutions on the SDGs - to acquire and/or apply basic, advanced and /or avant-garde, demonstrating the ability to work in multidisciplinary teams and/or undertake further studies with a high degree of autonomy | | x | | 0,28 |
| **G-RTR2** - To express information, ideas and the arguments that support them in an orderly, clear and coherent manner, orally and in writing, based on quality information, self-made or obtained from different sources, using inclusive and non-discriminatory language | | x | | 0,32 |
| | | | **Total:** | **6** |

*KC: Knowledge or Content / SK: Skills / AB: Abilities*

## SECONDARY LEARNING RESULTS

**RGI190** **[!]** *Conocer y aplicar las fases para desarrollar de forma guiada, con los objetivos y la planificación previamente definidos, un proyecto de complejidad técnica acorde con los conocimientos de formación básica de la ingeniería. Reflexiona sobre los cono*

| LEARNING ACTIVITIES | CH | NCH | TH |
|---|---|---|---|
| Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams | 3 h. | 1 h. | 4 h. |

| EVALUATION SYSTEM | W | MAKE-UP MECHANISMS |
|---|---|---|
| Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems | 20% | *(No mechanisms)* |
| Presentation and defence of exercises, case studies, computer practical work, simulation practical work, laboratory practical work, term projects, end of degree project, master's thesis, challenges and problems | 50% | |
| Prototype / Product | 30% | |

**Comments:** Continuous assessment.

**CH - Class hours:** 3 h.
**NCH - Non-class hours:** 1 h.
**TH - Total hours:** 4 h.

**RGI191** **[!]** *Contribuir en la estrategia de funcionamiento del equipo priorizando los objetivos comunes, fomentando y valorando la participación de todas las personas y responsabilizándose de las tareas individuales, así como del cumplimiento de plazos*

| LEARNING ACTIVITIES | CH | NCH | TH |
|---|---|---|---|
| Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams | 2 h. | 1 h. | 3 h. |

| EVALUATION SYSTEM | W | MAKE-UP MECHANISMS |
|---|---|---|
| Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems | 20% | *(No mechanisms)* |
| Presentation and defence of exercises, case studies, computer practical work, simulation practical work, laboratory practical work, term projects, end of degree project, master's thesis, challenges and problems | 50% | |
| Prototype / Product | 30% | |

**Comments:** Continuous assessment.

**CH - Class hours:** 2 h.
**NCH - Non-class hours:** 1 h.
**TH - Total hours:** 3 h.

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**RGI193** [!] *Redacta una memoria de proyecto clara y concisa utilizando las fuentes de información y estructura de memoria facilitadas, y haciendo un uso correcto, inclusivo y no discriminatorio del lenguaje*

| LEARNING ACTIVITIES | CH | NCH | TH |
|---|---|---|---|
| Development and writing of records, reports, presentations, audiovisual material, etc. on projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams | 3 h. | 1 h. | 4 h. |

| EVALUATION SYSTEM | W | MAKE-UP MECHANISMS |
|---|---|---|
| Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems | 20% | *(No mechanisms)* |
| Presentation and defence of exercises, case studies, computer practical work, simulation practical work, laboratory practical work, term projects, end of degree project, master's thesis, challenges and problems | 50% | |
| Prototype / Product | 30% | |

**Comments:** Continuous assessment. It may be asked to redo the document.

**CH - Class hours:** 3 h.
**NCH - Non-class hours:** 1 h.
**TH - Total hours:** 4 h.

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**RGI194** [!] *Realiza una presentación oral y defensa del proyecto clara y concisa, haciendo uso correcto, inclusivo y no discriminatorio del lenguaje*

| LEARNING ACTIVITIES | CH | NCH | TH |
|---|---|---|---|
| Development and writing of records, reports, presentations, audiovisual material, etc. on projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams | 3 h. | 1 h. | 4 h. |

| EVALUATION SYSTEM | W | MAKE-UP MECHANISMS |
|---|---|---|
| Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems | 20% | *(No mechanisms)* |
| Presentation and defence of exercises, case studies, computer practical work, simulation practical work, laboratory practical work, term projects, end of degree project, master's thesis, challenges and problems | 50% | |
| Prototype / Product | 30% | |

**Comments:** Continuous assessment.

**CH - Class hours:** 3 h.
**NCH - Non-class hours:** 1 h.
**TH - Total hours:** 4 h.

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**RGI130** [!] *Diseña sistemas digitales que permitan solucionar un problema a partir de la documentación técnica*

| LEARNING ACTIVITIES | CH | NCH | TH |
|---|---|---|---|
| Personal study and flexible development of concepts and subjects using active dynamics, to foster more meaningful learning | 8 h. | 4 h. | 12 h. |
| Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints | 1 h. | ,5 h. | 1,5 h. |
| Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects | 4 h. | 2 h. | 6 h. |
| Carrying out exercises and solving problems individually and/or in teams | 15 h. | 8,5 h. | 23,5 h. |

| EVALUATION SYSTEM | W | MAKE-UP MECHANISMS |
|---|---|---|
| Individual written and/or oral tests or individual coding/programming tests | 100% | Individual written and/or oral tests or individual coding/programming tests |
| **Comments:** Minimum grade: 5 | | **Comments:** Students with less than 5 in the Control point must retake the exam. Control point value will be 25% and retake 75%. |

**CH - Class hours:** 28 h.
**NCH - Non-class hours:** 15 h.
**TH - Total hours:** 43 h.

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**RGI131** [!] *Aplica las herramientas y procesos de programación, simulación e implementación para desarrollar sistemas digitales que den respuesta al problema propuesto*

| LEARNING ACTIVITIES | CH | NCH | TH |
|---|---|---|---|
| Personal study and flexible development of concepts and subjects using active dynamics, to foster more meaningful learning | 8 h. | 4 h. | 12 h. |
| Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints | 1 h. | ,5 h. | 1,5 h. |
| Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects | 5 h. | 2 h. | 7 h. |
| Carrying out exercises and solving problems individually and/or in teams | 23 h. | 16,5 h. | 39,5 h. |

| EVALUATION SYSTEM | W | MAKE-UP MECHANISMS |
|---|---|---|
| Individual written and/or oral tests or individual coding/programming tests | 100% | Individual written and/or oral tests or individual coding/programming tests |
| **Comments:** Minimum grade: 5 | | **Comments:** Students with less than 5 in the Control point must retake the exam. Control point value will be 25% and retake 75%. |

**CH - Class hours:** 37 h.
**NCH - Non-class hours:** 23 h.
**TH - Total hours:** 60 h.

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**RGI132** [!] *Aplica de forma crítica las teorías y procedimientos más relevantes que hayan permitido desarrollar un sistema digital que dé respuesta a un problema interdisciplinar*

| LEARNING ACTIVITIES | CH | NCH | TH |
|---|---|---|---|
| Development and writing of records, reports, presentations, audiovisual material, etc. on | 2 h. | 1 h. | 3 h. |

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Goi Eskola
Politeknikoa
Escuela Politécnica
Superior

| | | | |
|---|---|---|---|
| projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams | | | |
| Personal study and flexible development of concepts and subjects using active dynamics, to foster more meaningful learning | 3 h. | 1 h. | 4 h. |
| Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints | 1 h. | | 1 h. |
| Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams | 8 h. | 4 h. | 12 h. |
| Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects | 1 h. | | 1 h. |
| Carrying out exercises and solving problems individually and/or in teams | 7 h. | 4 h. | 11 h. |

| EVALUATION SYSTEM | W | MAKE-UP MECHANISMS |
|---|---|---|
| Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems | 10% | Individual written and/or oral tests or individual coding/programming tests |
| Presentation and defence of exercises, case studies, computer practical work, simulation practical work, laboratory practical work, term projects, end of degree project, master's thesis, challenges and problems | 25% | **Comments:** Students with less than 5 in the Control point must retake the exam. Control point value will be 25% and retake 75%. Project: There will not be any retake of the individual defense. |
| Individual written and/or oral tests or individual coding/programming tests | 50% | |
| Prototype / Product | 15% | |
| **Comments:** Minimum grade: 5 Project evaluation based on technical rubric | | |

**CH - Class hours:** 22 h.
**NCH - Non-class hours:** 10 h.
**TH - Total hours:** 32 h.

## CONTENTS

1. Introduction to electronic circuits    1.1. Fundamentals of Electronic Circuits    1.2. Digital technologies    1.3. Electronic Components: FET Transistors    1.4. Digital Circuits: CMOS Architecture    1.5. Programmable Logic Devices (FPGA-s )2. Structure of logic circuits    2.1. Schematics and prototypes 2.2. Combinational circuit structures    2.3. SOP and POS circuits3. Logic minimisation (simplification)    3.1. Fundamentals    3.2. Boolean algebra    3.3. Karnaugh4. Introduction to VHDL5. Combinational Circuits    5.1 Multiplexers    5.2 Demultiplexers    5.3 Decoders    5.4 Shifters6. Artimetico-logic circuits    6.1 Adder/Subtractor    6.2 Arithmetic-Logic Unit7. Memories    7.1.Lacth-FF    7.2.Registers    7.3 .Memories    7.4.Addressing8.Sequential Circuits    8.1. State diagrams    8.2. Counters    8.3. Mealy and Moore State Machines9. USART    9.1. Asynchronous Communication    9.2. Serial/Parallel Communication    9.3. Protocols

## LEARNING RESOURCES AND BIBLIOGRAPHY

| Learning resources | Bibliography |
|---|---|
| Subject notes | https://labur.eus/biblio-GIG301 |
| Moodle Platform | |
| Specific Master Software | |
| Lab practical training | |