Universidad del País Vasco Euskal Herriko Unibertsitatea

ENGLISH FRIENDLY COURSES (EFC) 2024-2025
CAMPUS OF ÁLAVA

Link to website: https://www.ehu.eus/en/web/vitoria-gasteizko-ingeniaritza-eskola/incoming-students
Contact: esc-ingenieria.internacional@ehu.es

In addition to the general offer of courses taught in English, some Centers offer for incoming students English Friendly Courses (EFC): subjects taught in Spanish or Basque, in which the syllabus summary; lecturer tutoring, examinations and/or papers are available in English.

English Friendly Courses taught in SPANISH:

FACULTY OF ENGINEERING - VITORIA-GASTEIZ (163)

	COURSE	SEMESTER[1]	CREDITS	SCHEDULE[2]	LINK TO SYLLABUS
Common Courses for Industrial Branch					
25974	Fundamentos Físicos de la Ingeniería	Annual	12	M	
25975	Fundamentos Químicos de la Ingeniería	Annual	9	M	➡
25984	Mecánica Aplicada	Annual	9	A	➡
25980	Fundamentos de Tecnología Eléctrica	Annual	9	A	
25979	Mecánica de Fluidos	2nd	6	A	
25985	Sistemas de Producción y Fabricación	2nd	6	A	
Bachelor's Degree in Industrial Electronics and Automation Engineering					
25999	Informática Industrial	1st	6	A	➡
26005	Sistemas Empotrados	1st	6	A	➡
25996	Sistemas Electrónicos Digitales	2nd	6	M	➡
26006	Ampliación de Informática Industrial	2nd	6	A	➡
26007	Control por Computador	2nd	6	A	
25988	Tecnologías Ambientales	1st	6	A	➡
25992	Electrónica Analógica	1st	6	M	➡
25993	Electrónica Digital	1st	6	M	➡
25994	Electrónica de Potencia	2nd	6	M	➡
25995	Instrumentación Electrónica	2nd	6	M	➡

[1] SEMESTER: 1st: September 2024 to January 2025
2nd : January 2025 to May 5
Annual: September 2024 to May 2025

[2] SCHEDULE: Morning (M)/ Afternoon (A): begins at 13.30.

Universidad del País Vasco Euskal Herriko Unibertsitatea

FACULTY OF ENGINEERING - VITORIA-GASTEIZ (163)

	COURSE	SEMESTER[1]	CREDITS	SCHEDULE[2]	LINK TO SYLLABUS
Bachelor`s Degree in Mechanical Engineering					
26045	Elasticidad y Resistencia de Materiales	1st	9	M	→
26046	Cinemática y Dinámica de Máquinas	1st	9	M	
26050	Instalaciones y Máquinas Hidráulicas	2nd	6	M	
25988	Tecnologías Ambientales	1st	6	A	→
26048	Estructuras y Construcciones Industriales	1st	9	M	→
26049	Diseño de Máquinas	2nd	9	M	→
Bachelor's Degree in Industrial Chemical Engineering					
26091	Química Industrial	2nd	6	M	→
25988	Tecnologías Ambientales	1ST	6	A	→
Bachelor's Degree in Automotive Engineering					
28138	Procesos de Fabricación en Tecnología Automotriz	1st	6	M	→
28141	Automatización avanzada en fabricación de automóviles	1st	4,5	A	→
28122	Introducción a la Mecánica	2nd	6	M	
25979	Mecánica de Fuidos	2nd	6	A	→
28126	Cálculo y Diseño de Estructuras Automovilísticas	1st	6	A	→
28132	Simulación y Análisis FEM en Automoción	2nd	6	A	→
28134	Aerodinámica	1st	6	M	
Double Degree: Mechanical Engineering and Industrial Electronics and Automation Engineering					
25996	Sistemas Electrónicos Digitales	2nd	6	M	→
25999	Informática Industrial	1st	6	M	→
Double Bachelor´s Degree in Mechanical Engineering and Business Management & Administration					
25988	Tecnologías Ambientales	1st	6	A	→
26045	Elasticidad y Resistencia de Materiales	1st	9	M	→
26046	Cinemática y Dinámica de Máquinas	1st	9	M	
26050	Instalaciones y Máquinas Hidráulicas	1st	9	M	

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Universidad del País Vasco Euskal Herriko Unibertsitatea

FACULTY OF ENGINEERING - VITORIA-GASTEIZ (163)					
	COURSE	SEMESTER[3]	CREDITS	SCHEDULE[4]	LINK TO SYLLABUS
Bachelor's Degree in Computer Engineering in Management and Information Systems					
26018	Arquitectura de Computadores	1st	6	A	
26021	Lenguajes, Computación y Sistemas Inteligentes	1st	6	A	
26023	Investigación Operativa	1st	6	A	
26025	Sistemas de Gestión de Seguridad de Sistemas de Información	1st	6	M	
26031	Programación Básica	1st	6	M	
26006	Ampliación de Informática Industrial	2nd	6	A	
26017	Ingeniería del Software	2nd	6	A	
26027	Sistemas de Apoyo a la Decisión	2nd	6	M	
26029	Sistemas Web	2nd	6	M	
26030	Administración de Bases de Datos	2nd	6	M	
26016	Estructura de Datos y Algoritmos	1st	6	A	
26028	Software de Gestión de Empresa	2nd	6	M	

[3] SEMESTER: 1st: September 2024 to January 2025
2nd : January 2025 to May 5
Annual: September 2024 to May 2025

[4] SCHEDULE: Morning (M)/ Afternoon (A): begins at 13.30.

English Friendly Courses taught in BASQUE:

FACULTY OF ENGINEERING - VITORIA-GASTEIZ (163)					
	COURSE	SEMESTER[5]	CREDITS	SCHEDULE[6]	LINK TO SYLLABUS
Bachelor's Degree in Automotive Engineering					
28125	Zirkuitu Elektrikoen Analisia	1st	6	A	⇨
28122	Mekanikaren Oinarriak	2nd	6	M	⇨
Bachelor's Degree in Industrial Electronics and Automation Engineering					
25981	Industria Electronika	1st	6	A	⇨
Bachelor`s Degree in Mechanical Engineering					
25981	Industria Electronika	1st	6	A	⇨
Double Bachelor´s Degree in Mechanical Engineering and Business Management & Administration					
25981	Industria Electronika	1st	6	A	⇨
Bachelor's Degree in Industrial Chemical Engineering					
25981	Industria Electronika	1st	6	A	⇨

[5] SEMESTER: 1st: September 2024 to January 2025
2nd : January 2025 to May 2025
Annual: September 2024 to May 2025

[6] SCHEDULE: Morning (M)/ Afternoon (A): begins at 13.30.

Universidad del País Vasco Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty 163 - Faculty of Engineering - Vitoria-Gasteiz **Cycle** .

Degree GIMADE10 - Doble Grado en Ingeniería Mecánica y en Administración y Direc **Year** First year

COURSE

25975 - Chemical Fundamentals of Engineering **Credits, ECTS:** 9

COURSE DESCRIPTION

Chemical Principles of Engineering enables students to acquire basic skills on the structure, properties and behavior of materials. This would make it possible to establish essential relationships between materials’ structure and their properties, as well as an understanding of certain industrial processes.

Chemical Principles of Engineering is a compulsory subject (9 ECTS credits) taught at the Faculty of Engineering Vitoria-Gasteiz in the first year of the following degrees: Bachelor in Industrial Electronic Engineering and Automatics, Bachelor in Mechanical Engineering, Bachelor in Industrial Chemical Engineering, and the double bachelor’s degrees in Mechanical Engineering + Business Administration and Management and in Industrial Electronic Engineering and Automatics + Mechanical Engineering.

This subject serves as the basis for several subsequent subjects taught at the Bachelors in Industrial Electronic Engineering and Automatics, and in Mechanical Engineering, such as Materials Science (2nd year) or Environmental Technologies (4th year). With respect to the Bachelor in Industrial Chemical Engineering, the acquisition of the skills associated with this subject is of utmost importance regarding the subsequent tackling of specific courses, such as Controlling and Instrumenting Chemical Processes, Experimentation in Chemical Engineering I and II, Physical Chemistry, Chemical Reaction Engineering, Unit Operations or Analytical Chemistry.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

COMPETENCES

SPECIFIC COMPETENCES

FB4. Ability to understand and apply the basic knowledge of principles of general chemistry, organic and inorganic chemistry, and their applications in engineering.

FB7. Ability to apply strategies of scientific method: analyze a problematic situation qualitatively and quantitatively, propose hypotheses and solutions using appropriate models.

FB8. Ability to communicate effectively the knowledge, procedures, results, skills and issues relating to basic engineering subjects, using appropriate vocabulary, terminology and means.

TRANSVERSAL COMPETENCES

FB10. Adoption of a responsible and ordered attitude at work, prepared to a lifelong learning experience.

LEARNING OUTCOMES

1. Know and apply models of the structure of the matter to understand the properties and behavior of substances and materials (FB4).

2. Know and understand the basic principles and theories about the physical and chemical processes that chemical substances can undergo under certain conditions in order to determine, in each case, the effects produced (FB4).

3. Resolve problems and/or laboratory experiences reasonably, including writing accurate lab-reports (FB7).

4. Communicate and transfer knowledge, procedures and results by using the specific terminology of chemical engineering (FB8).

5. Adopt a responsible and ordered attitude and a positive learning readiness (FB10).

6. Acquire knowledge and learning strategies that enable to progress in subsequent studies (FB10).

Theoretical and Practical Contents

To achieve the objectives defined in the subject, the following selection of contents has been made:

UNIT 1. BASIC PRINCIPLES
- Nomenclature of inorganic chemistry.
- States of matter.
- Basic concepts (atomic mass, mole concept, molar mass, etc.).
- Determination of chemical formulas (empirical and molecular formulas).
- Symbolic representation of chemical reactions through chemical equations.
- Basic concepts related with chemical equations (stoichiometry, limiting reagent, yield and purity).

UNIT 2. ATOMIC AND MOLECULAR STRUCTURE
- Quantum-mechanical model of the atom.
- Electronic structure.
- Periodic table. Periodic properties.
- Chemical bonding.
- Structure and properties of molecular compounds.

UNIT 3. AGREGATE STATES OF MATTER. PHASE EQUILIBRIA
- Solid state (types of crystalline solids and their characteristic properties (thermal conductivity, electrical conductivity in solid state, liquid or in solution, melting point and solubility, among others).
- Gaseous state (properties of the gases, ideal gaseous systems, kinetic theory of gases).
- Liquid state (surface tension, viscosity, vapour pressure).
- Equilibrium phase diagram.

UNIT 4. THERMOCHEMISTRY
- First principle of thermodynamics.
- Calculation of the change of internal energy (∆U) and enthalpy (∆H) in a substance. Energy exchange processes with and without phase change.
- Calculation of the change of internal energy (∆U) and enthalpy (∆H) in a chemical reaction.

UNIT 5. SOLUTIONS. COLLIGATIVE PROPERTIES
- Solutions and calculation of the concentration.
- Solubility and Henry’s Law.
- Colligative properties.
- Volatile solute solutions. Ideal behaviour (Raoult’s Law) and real behaviour (Pxy/Txy diagrams).
-Simple distillation process.

UNIT 6. BASIC PRINCIPLES OF ORGANIC CHEMISTRY
- Nomenclature of organic compounds. Functional groups.

UNIT 7. KINETICS OF CHEMICAL REACTIONS
- Basic concepts of chemical kinetics: reaction rate, reaction order and reaction law.
- Simple kinetics models: zero, first and second order reactions.
- Effect of temperature. Arrhenius equation.
- Introduction to catalysis.

UNIT 8. CHEMICAL EQUILIBRIUM
- Thermodynamic principles of chemical equilibrium.
- Le Chatelier’s principle.

UNIT 9. EQUILIBRIUM IN AQUEOUS SOLUTIONS
- Basic concepts (acid, base, conjugated species, amphoteric species).
- Acid (Ka) and basic (Kb) dissociation constant.
- pH scale.
- Reaction of hydrolysis.
- Acid-base titration (equivalence point, titration error and acid-base indicators).

UNIT 10. HETEROGENEOUS IONIC EQUILIBRIUM
- Precipitation reactions.
- Constant solubility product (Kps).
- The common-ion effect.
- The pH variation effect.
- Fractional precipitation.

UNIT 11. ELECTROCHEMISTRY
- Redox reactions.

- Voltaic or galvanic cell.
- Electrolytic cell.

TEACHING METHODS

PRESENTIAL ACTIVITIES

THEORETICAL CLASSES (45 h)

During the 30 weeks of the academic year, concepts and theoretical developments will be taught in a weekly session (1.5 h). Explanations will be complemented with standard exercises and activities that will allow the acquisition of stablished skills.

CLASSROOM PRACTICES (30 h)

During the 30 weeks of the academic year, resolution of exercises and practical activities will be carried out in a weekly session (1.0 h).

LABORATORY PRACTICES (15 h)

Students must complete 5 laboratory practices of 3 hours each. Lab sessions will be taught in the Laboratory practices will allow students to experiment and put into practice the knowledge acquired through lectures, classroom practices and personal work. Moreover, they will make it possible to learn about the basic experimental techniques used in a chemical laboratory and to acquire skills typical of laboratory work.

Students must complete 5 different laboratory practices of 3 h each. Lab sessions will be taught in the Basic Chemistry laboratory of the Faculty of Engineering Vitoria-Gasteiz, according to the calendar and schedule proposed for each group.

The practices will be carried out individually, as long as the available material allows it. Otherwise, the practices will be carried out in pairs, which will allow, additionally, to promote other skills, such as teamwork.

Each student must deliver a questionnaire before the beginning of each practical session, in which several questions related to the practice must be answered. This report must be answered and delivered individually at the time of entering the laboratory. At the end of the practical session, the students must take a test related to the content of the practice. Finally, the students will have one week to deliver a final report containing the results obtained and the main conclusions of the practice.

TUTORSHIP SESSIONS

In general, it is a voluntary activity (individual or collective) conducted in response to students’ request. However, throughout the course a series of voluntary group deliverables will be proposed that will require attendance at tutorials.

NON-PRESENTIAL ACTIVITIES (135 h)

Continued work of student is essential to develop the competences of the subject. In addition to preparing the written exams, students should devote the hours of non-presential teaching to:

o Complete notes, consult bibliography and solve questions and/or problems, including voluntary deliverable tasks (a time commitment of approximately 3-4 h per week).

o Prepare the laboratory sessions (a time commitment of 1.5-2.0 h to prepare the laboratory practice and answer a set of preliminary questions per practice) and complete the corresponding report (2.0-3.0 h commitment per practice).

If the extraordinary circumstances derived from the current public health emergency situation caused by the outbreak of COVID-19 oblige to develop online teaching, all media available in the UPV/EHU (Windows Teams, eGela, etc.) will be used.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	45		30	15					
Horas de Actividad No Presencial del Alumno/a	67,5		45	22,5					

Legend:
M: Lecture-based
S: Seminar
GA: Applied classroom-based groups
GL: Applied laboratory-based groups
GO: Applied computer-based groups
GCL: Applied clinical-based groups
TA: Workshop
TI: Industrial workshop
GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 70%
- Exercises, cases or problem sets 10%
- Laboratory practices 20%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

EVALUATION SYSTEM

WRITTEN TEST/EXAM (70 % of the final mark)

The written test will comprise two partial tests:

- The first test corresponds to the contents of the first four-month period and will be carried out during the month of January, coinciding with the period established by the Center to carry out the exams of the first four-month period.

-The second test will be carried out in May, coinciding with the period established by the Center to perform the exams of the Ordinary Call. In this case:

If the student has obtained a mark ≥5 in the first test, he/she will be evaluated on the contents of the second four-month period.

The final grade corresponding to the written test will be calculated as the simple average of the marks of the two tests, as long as a mark ≥4 has been obtained in the second test.

If the student has obtained a mark <5 in the first test, he/she will be evaluated on the contents of the whole subject. Moreover, the exam will be formed by two differentiated parts, belonging each one to the contents of each four-month period.

The final grade corresponding to the written test will be calculated as the simple average of the grades obtained in the 2 parts that make up the exam of the Ordinary Call, being necessary that both grades are ≥4 out of 10.

PRACTICAL ACTIVITIES (10 % of the final mark)

Practical activities will be undertaken throughout the course, such as problem solving and cases, written tests or questionnaires, amongst others.

LABORATORY PRACTICES (20 % of the final mark)

- Laboratory work: 25 %
- Presentation and evaluation of the previous deliverables: 15 %
- Evaluation test (after each lab-session): 25 %
- Presentation and evaluation of the final deliverables: 35 %

REQUIREMENTS to pass the subject:

- Complete all the laboratory practices and deliver all the previous questionnaires, post-practice evaluation tests and the final report within the deadline.

- Obtain a mark ≥5 in the final grade (obtained as a weighted average of the marks corresponding to the written test, practical activities and laboratory practices). Moreover, it is compulsory to:

o Obtain a mark ≥5 out of 10 in the written test (70 %).

o Obtain a mark ≥4 out of 10 in the laboratory practices (20 %).

o It is not necessary to obtain a minimum mark in the practical activities (10 %).

Those students who do not meet any of these requirements will be marked with a 4.0 (maximum) in the Ordinary Call regardless of the final grade obtained.

*If the extraordinary circumstances derived from the current public health emergency situation caused by the outbreak of COVID-19 oblige to develop an online evaluation, all media available in the UPV/EHU (Webex, eGela, etc.) will be used. The characteristics of this new evaluation mode will be published in eGela.

CALL RESIGNATION

Those students who do not appear for the written test will be recorded as "Not Presented" in the Ordinary call.

FINAL TEST

Students who meet the conditions established in the UPV/EHU regulations and request to take a final test within the deadline set for that purpose (Chapter II, Article 8 of the Agreement of December 15, 2016, of the Governing Council of the University of the Basque Country/Euskal Herriko Unibertsitatea, which approves the Regulations governing the students’ Evaluation in official Bachelor's degrees), they need to implement the following activities:

- A written test related to the theoretical-practical contents of the subject (80 % of the final grade).

- A practical laboratory exam (20 % of the final exam).

REQUIREMENTS to pass the subject (FINAL TEST)

Obtain a mark equal to or greater than 5 in the final grade (obtained as the weighted average of the marks corresponding to the written test and the practical exam).

*If the extraordinary circumstances derived from the current public health emergency situation caused by the outbreak of COVID-19 oblige to develop an online evaluation, all media available in the UPV/EHU (BlackBoard Collaborate, eGela, etc.) will be used. The characteristics of this new evaluation mode will be published in eGela.

CALL RESIGNATION

Those students who do not appear for the final test will be recorded as "Not Presented" in the Ordinary call.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The evaluation criteria in the extraordinary call will be:

- A written test formed by the following characteristics:

If the student has obtained a mark ≥5 in the exam related to the theoretical-practical contents of the first four-month period (mark obtained in the Call of January or May, with a weight of 40 % of the final grade of the Extraordinary call) and <5 in the exam related to the theoretical-practical contents of the second four-month period (mark obtained in the call of May), in the exam of the Extraordinary Call the student will be evaluated on the contents of the second four-month period. In this case, the exam will have a weight of 40 % of the final grade.

The final grade corresponding to the written test will be calculated as the simple average of the marks of the two tests, as long as a mark ≥4 has been obtained in the Extraordinary call exam.

If the student has obtained a mark <5 in the exam related to the theoretical-practical contents of the first four-month period (mark obtained in the Call of January or May) and ≥5 in the exam related to the theoretical-practical contents of the second four-month period (mark obtained in the call of May, with a weight of 40 % of the final grade of the Extraordinary call), in the exam of the Extraordinary Call the student will be evaluated on the contents of the first four-month period. In this case, the exam will have a weight of 40 % of the final grade.

The final grade corresponding to the written test will be calculated as the simple average of the marks of the two tests, as long as a mark ≥4 has been obtained in the Extraordinary call exam.

If the student has obtained a mark <5 in the exams related to the theoretical-practical contents of both four-month periods (both in the January and May calls), in the exam of the Extraordinary Call the student will be evaluated on the theoretical-practical contents of the whole subject. In this case, the exam will have a weight of 80 % on the final grade.

The final grade corresponding to the written test will be calculated as the simple average of the grades obtained in the 2 parts that make up the exam of the Extraordinary Call, being necessary that both grades are ≥4 out of 10.

- A practical laboratory exam (20 % of the final exam). A student will be exempt from this exam if all the laboratory practices throughout the course are completed and a mark ≥4 is obtained; this grade will have a weight of the 20 % of the final grade.

REQUIREMENTS to pass the subject

Obtain a mark ≥5 in the final grade (obtained as the weighted average of the marks corresponding to the written test and the practical exam or laboratory practices).

*If the extraordinary circumstances derived from the current public health emergency situation caused by the outbreak of COVID-19 oblige to develop an online evaluation, all media available in the UPV/EHU (BlackBoard Collaborate, eGela, etc.) will be used. The characteristics of this new evaluation mode will be published in eGela.

CALL RESIGNATION

Those students who do not appear for the written test will be recorded as "Not Presented" in the Extraordinary call.

MANDATORY MATERIALS

Collections of problems and specific questions related to the subject.

BIBLIOGRAPHY

Basic bibliography

NOMENCLATURE OF INORGANIC CHEMISTRY

o Beobide, G. (2019). Formulazioa eta nomenklatura kimikoa. IUPACen arauak eta ariketak. Ed. UPV/EHU.

o Quiñoá, E.; Riguera, R.; Vila, J. M. (2010). Nomenclatura y formulación de los compuestos inorgánicos. Ed. McGraw-Hill.

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GENERAL CHEMISTRY

o Brown, T. D.; Lemay, H. E.; Bruce, J. R.; Bursten, E.; Burdge, J. (2003). Química. La Ciencia Central. Ed. Pearson Prentice Hall.

o Casabó, J. (2009). Egitura atomikoa eta lotura kimikoa. Ed. UPV/EHU.

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o Quiñoá, E.; Riguera, R. (2004). Cuestiones y ejercicios de química orgánica. Ed. McGraw-Hill, 2º edición.

o McMurry, J.E.; Fay, R.C. (2009). Química General. Ed. Pearson Education, 5º edición.

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o Urretxa, I.; Iturbe, J. (1999). Kimikako problemak. Ed. Udako Euskal Unibertsitaea.

o Vollhardt, K.P.C.; Schorbe, N.E. (2008). Kimika organikoa egitura eta funtzioa. Ed. UPV/EHU.

LABORATORY PRACTICES

o Beran, J.A. (2014). Laboratory Manual for Principles of General Chemistry. Ed. Wiley.

o Chemical Education Material Study (1987). Química. Una ciencia experimental. Ed. Reverté.

o Martínez, J.; Narros, A.; de la Fuente, Mª del Mar; Pozas, F.; Díaz, V. M. (2009). Experimentación en química general. Ed. Paraninfo.

o Navarro, A.; Gonzalez, F. (1986). Prácticas y técnicas de laboratorio. Ed. Universidad Politécnica de Catalunya.

Detailed bibliography

o Casabó, J. (2007). Estructura atómica y enlace químico. Editorial Reverté.

o Ghasem, N.; Henda, R. (2009). Principles of Chemical Engineering Processes. Editorial Taylor & Francis Group.

o Primo-Yúfera, E. (2007). Química Orgánica básica y aplicada: de la molécula a la industria. Tomo II. Editorial Reverté.

o Rodgers, G. E.; Cabañas, M. V.; Regi, M. V. (1995). Química inorgánica: introducción a la química de coordinación, del estado sólido y descriptiva. Editorial McGraw-Hill Interamericana de España.

Journals

Web sites of interest

http://www.egela.ehu.es

http://www.ptable.com/?lang=es

https://www.luc.edu/media/lucedu/sustainability-new/pdfs-biodiesel/Biodiesel%20Curricula%20-%20Version%205.0.pdf

OBSERVATIONS

Universidad del País Vasco Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty 163 - Faculty of Engineering - Vitoria-Gasteiz **Cycle** .

Degree GDIMEL10 - Doble Grado en Ingeniería Mecánica + Ingeniería Electrónica Ind **Year** First year

COURSE

25975 - Chemical Fundamentals of Engineering **Credits, ECTS:** 9

COURSE DESCRIPTION

Chemical Principles of Engineering enables students to acquire basic skills on the structure, properties and behavior of materials. This would make it possible to establish essential relationships between materials’ structure and their properties, as well as an understanding of certain industrial processes.

Chemical Principles of Engineering is a compulsory subject (9 ECTS credits) taught at the Faculty of Engineering Vitoria-Gasteiz in the first year of the following degrees: Bachelor in Industrial Electronic Engineering and Automatics, Bachelor in Mechanical Engineering, Bachelor in Industrial Chemical Engineering, and the double bachelor’s degrees in Mechanical Engineering + Business Administration and Management and in Industrial Electronic Engineering and Automatics + Mechanical Engineering.

This subject serves as the basis for several subsequent subjects taught at the Bachelors in Industrial Electronic Engineering and Automatics, and in Mechanical Engineering, such as Materials Science (2nd year) or Environmental Technologies (4th year). With respect to the Bachelor in Industrial Chemical Engineering, the acquisition of the skills associated with this subject is of utmost importance regarding the subsequent tackling of specific courses, such as Controlling and Instrumenting Chemical Processes, Experimentation in Chemical Engineering I and II, Physical Chemistry, Chemical Reaction Engineering, Unit Operations or Analytical Chemistry.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

COMPETENCES

SPECIFIC COMPETENCES

FB4. Ability to understand and apply the basic knowledge of principles of general chemistry, organic and inorganic chemistry, and their applications in engineering.

FB7. Ability to apply strategies of scientific method: analyze a problematic situation qualitatively and quantitatively, propose hypotheses and solutions using appropriate models.

FB8. Ability to communicate effectively the knowledge, procedures, results, skills and issues relating to basic engineering subjects, using appropriate vocabulary, terminology and means.

TRANSVERSAL COMPETENCES

FB10. Adoption of a responsible and ordered attitude at work, prepared to a lifelong learning experience.

LEARNING OUTCOMES

1. Know and apply models of the structure of the matter to understand the properties and behavior of substances and materials (FB4).

2. Know and understand the basic principles and theories about the physical and chemical processes that chemical substances can undergo under certain conditions in order to determine, in each case, the effects produced (FB4).

3. Resolve problems and/or laboratory experiences reasonably, including writing accurate lab-reports (FB7).

4. Communicate and transfer knowledge, procedures and results by using the specific terminology of chemical engineering (FB8).

5. Adopt a responsible and ordered attitude and a positive learning readiness (FB10).

6. Acquire knowledge and learning strategies that enable to progress in subsequent studies (FB10).

Theoretical and Practical Contents

To achieve the objectives defined in the subject, the following selection of contents has been made:

UNIT 1. BASIC PRINCIPLES
- Nomenclature of inorganic chemistry.
- States of matter.
- Basic concepts (atomic mass, mole concept, molar mass, etc.).
- Determination of chemical formulas (empirical and molecular formulas).
- Symbolic representation of chemical reactions through chemical equations.
- Basic concepts related with chemical equations (stoichiometry, limiting reagent, yield and purity).

UNIT 2. ATOMIC AND MOLECULAR STRUCTURE
- Quantum-mechanical model of the atom.
- Electronic structure.
- Periodic table. Periodic properties.
- Chemical bonding.
- Structure and properties of molecular compounds.

UNIT 3. AGREGATE STATES OF MATTER. PHASE EQUILIBRIA
- Solid state (types of crystalline solids and their characteristic properties (thermal conductivity, electrical conductivity in solid state, liquid or in solution, melting point and solubility, among others).
- Gaseous state (properties of the gases, ideal gaseous systems, kinetic theory of gases).
- Liquid state (surface tension, viscosity, vapour pressure).
- Equilibrium phase diagram.

UNIT 4. THERMOCHEMISTRY
- First principle of thermodynamics.
- Calculation of the change of internal energy (∆U) and enthalpy (∆H) in a substance. Energy exchange processes with and without phase change.
- Calculation of the change of internal energy (∆U) and enthalpy (∆H) in a chemical reaction.

UNIT 5. SOLUTIONS. COLLIGATIVE PROPERTIES
- Solutions and calculation of the concentration.
- Solubility and Henry’s Law.
- Colligative properties.
- Volatile solute solutions. Ideal behaviour (Raoult’s Law) and real behaviour (Pxy/Txy diagrams).
-Simple distillation process.

UNIT 6. BASIC PRINCIPLES OF ORGANIC CHEMISTRY
- Nomenclature of organic compounds. Functional groups.

UNIT 7. KINETICS OF CHEMICAL REACTIONS
- Basic concepts of chemical kinetics: reaction rate, reaction order and reaction law.
- Simple kinetics models: zero, first and second order reactions.
- Effect of temperature. Arrhenius equation.
- Introduction to catalysis.

UNIT 8. CHEMICAL EQUILIBRIUM
- Thermodynamic principles of chemical equilibrium.
- Le Chatelier’s principle.

UNIT 9. EQUILIBRIUM IN AQUEOUS SOLUTIONS
- Basic concepts (acid, base, conjugated species, amphoteric species).
- Acid (Ka) and basic (Kb) dissociation constant.
- pH scale.
- Reaction of hydrolysis.
- Acid-base titration (equivalence point, titration error and acid-base indicators).

UNIT 10. HETEROGENEOUS IONIC EQUILIBRIUM
- Precipitation reactions.
- Constant solubility product (Kps).
- The common-ion effect.
- The pH variation effect.
- Fractional precipitation.

UNIT 11. ELECTROCHEMISTRY
- Redox reactions.

- Voltaic or galvanic cell.
- Electrolytic cell.

TEACHING METHODS

PRESENTIAL ACTIVITIES

THEORETICAL CLASSES (45 h)

During the 30 weeks of the academic year, concepts and theoretical developments will be taught in a weekly session (1.5 h). Explanations will be complemented with standard exercises and activities that will allow the acquisition of stablished skills.

CLASSROOM PRACTICES (30 h)

During the 30 weeks of the academic year, resolution of exercises and practical activities will be carried out in a weekly session (1.0 h).

LABORATORY PRACTICES (15 h)

Students must complete 5 laboratory practices of 3 hours each. Lab sessions will be taught in the Laboratory practices will allow students to experiment and put into practice the knowledge acquired through lectures, classroom practices and personal work. Moreover, they will make it possible to learn about the basic experimental techniques used in a chemical laboratory and to acquire skills typical of laboratory work.

Students must complete 5 different laboratory practices of 3 h each. Lab sessions will be taught in the Basic Chemistry laboratory of the Faculty of Engineering Vitoria-Gasteiz, according to the calendar and schedule proposed for each group.

The practices will be carried out individually, as long as the available material allows it. Otherwise, the practices will be carried out in pairs, which will allow, additionally, to promote other skills, such as teamwork.

Each student must deliver a questionnaire before the beginning of each practical session, in which several questions related to the practice must be answered. This report must be answered and delivered individually at the time of entering the laboratory. At the end of the practical session, the students must take a test related to the content of the practice. Finally, the students will have one week to deliver a final report containing the results obtained and the main conclusions of the practice.

TUTORSHIP SESSIONS

In general, it is a voluntary activity (individual or collective) conducted in response to students’ request. However, throughout the course a series of voluntary group deliverables will be proposed that will require attendance at tutorials.

NON-PRESENTIAL ACTIVITIES (135 h)

Continued work of student is essential to develop the competences of the subject. In addition to preparing the written exams, students should devote the hours of non-presential teaching to:

o Complete notes, consult bibliography and solve questions and/or problems, including voluntary deliverable tasks (a time commitment of approximately 3-4 h per week).

o Prepare the laboratory sessions (a time commitment of 1.5-2.0 h to prepare the laboratory practice and answer a set of preliminary questions per practice) and complete the corresponding report (2.0-3.0 h commitment per practice).

If the extraordinary circumstances derived from the current public health emergency situation caused by the outbreak of COVID-19 oblige to develop online teaching, all media available in the UPV/EHU (Windows Teams, eGela, etc.) will be used.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	45		30	15					
Horas de Actividad No Presencial del Alumno/a	67,5		45	22,5					

Legend:
M: Lecture-based
S: Seminar
GA: Applied classroom-based groups
GL: Applied laboratory-based groups
GO: Applied computer-based groups
GCL: Applied clinical-based groups
TA: Workshop
TI: Industrial workshop
GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 70%
- Exercises, cases or problem sets 10%
- Laboratory practices 20%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

EVALUATION SYSTEM

WRITTEN TEST/EXAM (70 % of the final mark)

The written test will comprise two partial tests:

- The first test corresponds to the contents of the first four-month period and will be carried out during the month of January, coinciding with the period established by the Center to carry out the exams of the first four-month period.

-The second test will be carried out in May, coinciding with the period established by the Center to perform the exams of the Ordinary Call. In this case:

If the student has obtained a mark ≥5 in the first test, he/she will be evaluated on the contents of the second four-month period.

The final grade corresponding to the written test will be calculated as the simple average of the marks of the two tests, as long as a mark ≥4 has been obtained in the second test.

If the student has obtained a mark <5 in the first test, he/she will be evaluated on the contents of the whole subject. Moreover, the exam will be formed by two differentiated parts, belonging each one to the contents of each four-month period.

The final grade corresponding to the written test will be calculated as the simple average of the grades obtained in the 2 parts that make up the exam of the Ordinary Call, being necessary that both grades are ≥4 out of 10.

PRACTICAL ACTIVITIES (10 % of the final mark)

Practical activities will be undertaken throughout the course, such as problem solving and cases, written tests or questionnaires, amongst others.

LABORATORY PRACTICES (20 % of the final mark)

- Laboratory work: 25 %
- Presentation and evaluation of the previous deliverables: 15 %
- Evaluation test (after each lab-session): 25 %
- Presentation and evaluation of the final deliverables: 35 %

REQUIREMENTS to pass the subject:

- Complete all the laboratory practices and deliver all the previous questionnaires, post-practice evaluation tests and the final report within the deadline.

- Obtain a mark ≥5 in the final grade (obtained as a weighted average of the marks corresponding to the written test, practical activities and laboratory practices). Moreover, it is compulsory to:

o Obtain a mark ≥5 out of 10 in the written test (70 %).

o Obtain a mark ≥4 out of 10 in the laboratory practices (20 %).

o It is not necessary to obtain a minimum mark in the practical activities (10 %).

Those students who do not meet any of these requirements will be marked with a 4.0 (maximum) in the Ordinary Call regardless of the final grade obtained.

*If the extraordinary circumstances derived from the current public health emergency situation caused by the outbreak of COVID-19 oblige to develop an online evaluation, all media available in the UPV/EHU (Webex, eGela, etc.) will be used. The characteristics of this new evaluation mode will be published in eGela.

CALL RESIGNATION

Those students who do not appear for the written test will be recorded as "Not Presented" in the Ordinary call.

FINAL TEST

Students who meet the conditions established in the UPV/EHU regulations and request to take a final test within the deadline set for that purpose (Chapter II, Article 8 of the Agreement of December 15, 2016, of the Governing Council of the University of the Basque Country/Euskal Herriko Unibertsitatea, which approves the Regulations governing the students’ Evaluation in official Bachelor's degrees), they need to implement the following activities:

- A written test related to the theoretical-practical contents of the subject (80 % of the final grade).

- A practical laboratory exam (20 % of the final exam).

REQUIREMENTS to pass the subject (FINAL TEST)

Obtain a mark equal to or greater than 5 in the final grade (obtained as the weighted average of the marks corresponding to the written test and the practical exam).

*If the extraordinary circumstances derived from the current public health emergency situation caused by the outbreak of COVID-19 oblige to develop an online evaluation, all media available in the UPV/EHU (BlackBoard Collaborate, eGela, etc.) will be used. The characteristics of this new evaluation mode will be published in eGela.

CALL RESIGNATION

Those students who do not appear for the final test will be recorded as "Not Presented" in the Ordinary call.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The evaluation criteria in the extraordinary call will be:

- A written test formed by the following characteristics:

If the student has obtained a mark ≥5 in the exam related to the theoretical-practical contents of the first four-month period (mark obtained in the Call of January or May, with a weight of 40 % of the final grade of the Extraordinary call) and <5 in the exam related to the theoretical-practical contents of the second four-month period (mark obtained in the call of May), in the exam of the Extraordinary Call the student will be evaluated on the contents of the second four-month period. In this case, the exam will have a weight of 40 % of the final grade.

The final grade corresponding to the written test will be calculated as the simple average of the marks of the two tests, as long as a mark ≥4 has been obtained in the Extraordinary call exam.

If the student has obtained a mark <5 in the exam related to the theoretical-practical contents of the first four-month period (mark obtained in the Call of January or May) and ≥5 in the exam related to the theoretical-practical contents of the second four-month period (mark obtained in the call of May, with a weight of 40 % of the final grade of the Extraordinary call), in the exam of the Extraordinary Call the student will be evaluated on the contents of the first four-month period. In this case, the exam will have a weight of 40 % of the final grade.

The final grade corresponding to the written test will be calculated as the simple average of the marks of the two tests, as long as a mark ≥4 has been obtained in the Extraordinary call exam.

If the student has obtained a mark <5 in the exams related to the theoretical-practical contents of both four-month periods (both in the January and May calls), in the exam of the Extraordinary Call the student will be evaluated on the theoretical-practical contents of the whole subject. In this case, the exam will have a weight of 80 % on the final grade.

The final grade corresponding to the written test will be calculated as the simple average of the grades obtained in the 2 parts that make up the exam of the Extraordinary Call, being necessary that both grades are ≥4 out of 10.

- A practical laboratory exam (20 % of the final exam). A student will be exempt from this exam if all the laboratory practices throughout the course are completed and a mark ≥4 is obtained; this grade will have a weight of the 20 % of the final grade.

REQUIREMENTS to pass the subject

Obtain a mark ≥5 in the final grade (obtained as the weighted average of the marks corresponding to the written test and the practical exam or laboratory practices).

*If the extraordinary circumstances derived from the current public health emergency situation caused by the outbreak of COVID-19 oblige to develop an online evaluation, all media available in the UPV/EHU (BlackBoard Collaborate, eGela, etc.) will be used. The characteristics of this new evaluation mode will be published in eGela.

CALL RESIGNATION

Those students who do not appear for the written test will be recorded as "Not Presented" in the Extraordinary call.

MANDATORY MATERIALS

Collections of problems and specific questions related to the subject.

BIBLIOGRAPHY

Basic bibliography

NOMENCLATURE OF INORGANIC CHEMISTRY

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LABORATORY PRACTICES

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o Casabó, J. (2007). Estructura atómica y enlace químico. Editorial Reverté.

o Ghasem, N.; Henda, R. (2009). Principles of Chemical Engineering Processes. Editorial Taylor & Francis Group.

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Journals

Web sites of interest

http://www.egela.ehu.es

http://www.ptable.com/?lang=es

https://www.luc.edu/media/lucedu/sustainability-new/pdfs-biodiesel/Biodiesel%20Curricula%20-%20Version%205.0.pdf

OBSERVATIONS

Universidad del País Vasco Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty 163 - Faculty of Engineering - Vitoria-Gasteiz **Cycle** .

Degree GIEIAU10 - Bachelor's Degree in Industrial Electronics and Automation Engine **Year** First year

COURSE

25975 - Chemical Fundamentals of Engineering **Credits, ECTS:** 9

COURSE DESCRIPTION

Chemical Principles of Engineering enables students to acquire basic skills on the structure, properties and behavior of materials. This would make it possible to establish essential relationships between materials’ structure and their properties, as well as an understanding of certain industrial processes.

Chemical Principles of Engineering is a compulsory subject (9 ECTS credits) taught at the Faculty of Engineering Vitoria-Gasteiz in the first year of the following degrees: Bachelor in Industrial Electronic Engineering and Automatics, Bachelor in Mechanical Engineering, Bachelor in Industrial Chemical Engineering, and the double bachelor’s degrees in Mechanical Engineering + Business Administration and Management and in Industrial Electronic Engineering and Automatics + Mechanical Engineering.

This subject serves as the basis for several subsequent subjects taught at the Bachelors in Industrial Electronic Engineering and Automatics, and in Mechanical Engineering, such as Materials Science (2nd year) or Environmental Technologies (4th year). With respect to the Bachelor in Industrial Chemical Engineering, the acquisition of the skills associated with this subject is of utmost importance regarding the subsequent tackling of specific courses, such as Controlling and Instrumenting Chemical Processes, Experimentation in Chemical Engineering I and II, Physical Chemistry, Chemical Reaction Engineering, Unit Operations or Analytical Chemistry.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

COMPETENCES

SPECIFIC COMPETENCES

FB4. Ability to understand and apply the basic knowledge of principles of general chemistry, organic and inorganic chemistry, and their applications in engineering.

FB7. Ability to apply strategies of scientific method: analyze a problematic situation qualitatively and quantitatively, propose hypotheses and solutions using appropriate models.

FB8. Ability to communicate effectively the knowledge, procedures, results, skills and issues relating to basic engineering subjects, using appropriate vocabulary, terminology and means.

TRANSVERSAL COMPETENCES

FB10. Adoption of a responsible and ordered attitude at work, prepared to a lifelong learning experience.

LEARNING OUTCOMES

1. Know and apply models of the structure of the matter to understand the properties and behavior of substances and materials (FB4).

2. Know and understand the basic principles and theories about the physical and chemical processes that chemical substances can undergo under certain conditions in order to determine, in each case, the effects produced (FB4).

3. Resolve problems and/or laboratory experiences reasonably, including writing accurate lab-reports (FB7).

4. Communicate and transfer knowledge, procedures and results by using the specific terminology of chemical engineering (FB8).

5. Adopt a responsible and ordered attitude and a positive learning readiness (FB10).

6. Acquire knowledge and learning strategies that enable to progress in subsequent studies (FB10).

Theoretical and Practical Contents

To achieve the objectives defined in the subject, the following selection of contents has been made:

UNIT 1. BASIC PRINCIPLES
- Nomenclature of inorganic chemistry.
- States of matter.
- Basic concepts (atomic mass, mole concept, molar mass, etc.).
- Determination of chemical formulas (empirical and molecular formulas).
- Symbolic representation of chemical reactions through chemical equations.
- Basic concepts related with chemical equations (stoichiometry, limiting reagent, yield and purity).

UNIT 2. ATOMIC AND MOLECULAR STRUCTURE
- Quantum-mechanical model of the atom.
- Electronic structure.
- Periodic table. Periodic properties.
- Chemical bonding.
- Structure and properties of molecular compounds.

UNIT 3. AGREGATE STATES OF MATTER. PHASE EQUILIBRIA
- Solid state (types of crystalline solids and their characteristic properties (thermal conductivity, electrical conductivity in solid state, liquid or in solution, melting point and solubility, among others).
- Gaseous state (properties of the gases, ideal gaseous systems, kinetic theory of gases).
- Liquid state (surface tension, viscosity, vapour pressure).
- Equilibrium phase diagram.

UNIT 4. THERMOCHEMISTRY
- First principle of thermodynamics.
- Calculation of the change of internal energy (∆U) and enthalpy (∆H) in a substance. Energy exchange processes with and without phase change.
- Calculation of the change of internal energy (∆U) and enthalpy (∆H) in a chemical reaction.

UNIT 5. SOLUTIONS. COLLIGATIVE PROPERTIES
- Solutions and calculation of the concentration.
- Solubility and Henry’s Law.
- Colligative properties.
- Volatile solute solutions. Ideal behaviour (Raoult’s Law) and real behaviour (Pxy/Txy diagrams).
-Simple distillation process.

UNIT 6. BASIC PRINCIPLES OF ORGANIC CHEMISTRY
- Nomenclature of organic compounds. Functional groups.

UNIT 7. KINETICS OF CHEMICAL REACTIONS
- Basic concepts of chemical kinetics: reaction rate, reaction order and reaction law.
- Simple kinetics models: zero, first and second order reactions.
- Effect of temperature. Arrhenius equation.
- Introduction to catalysis.

UNIT 8. CHEMICAL EQUILIBRIUM
- Thermodynamic principles of chemical equilibrium.
- Le Chatelier’s principle.

UNIT 9. EQUILIBRIUM IN AQUEOUS SOLUTIONS
- Basic concepts (acid, base, conjugated species, amphoteric species).
- Acid (Ka) and basic (Kb) dissociation constant.
- pH scale.
- Reaction of hydrolysis.
- Acid-base titration (equivalence point, titration error and acid-base indicators).

UNIT 10. HETEROGENEOUS IONIC EQUILIBRIUM
- Precipitation reactions.
- Constant solubility product (Kps).
- The common-ion effect.
- The pH variation effect.
- Fractional precipitation.

UNIT 11. ELECTROCHEMISTRY
- Redox reactions.

- Voltaic or galvanic cell.
- Electrolytic cell.

TEACHING METHODS

PRESENTIAL ACTIVITIES

THEORETICAL CLASSES (45 h)

During the 30 weeks of the academic year, concepts and theoretical developments will be taught in a weekly session (1.5 h). Explanations will be complemented with standard exercises and activities that will allow the acquisition of stablished skills.

CLASSROOM PRACTICES (30 h)

During the 30 weeks of the academic year, resolution of exercises and practical activities will be carried out in a weekly session (1.0 h).

LABORATORY PRACTICES (15 h)

Students must complete 5 laboratory practices of 3 hours each. Lab sessions will be taught in the Laboratory practices will allow students to experiment and put into practice the knowledge acquired through lectures, classroom practices and personal work. Moreover, they will make it possible to learn about the basic experimental techniques used in a chemical laboratory and to acquire skills typical of laboratory work.

Students must complete 5 different laboratory practices of 3 h each. Lab sessions will be taught in the Basic Chemistry laboratory of the Faculty of Engineering Vitoria-Gasteiz, according to the calendar and schedule proposed for each group.

The practices will be carried out individually, as long as the available material allows it. Otherwise, the practices will be carried out in pairs, which will allow, additionally, to promote other skills, such as teamwork.

Each student must deliver a questionnaire before the beginning of each practical session, in which several questions related to the practice must be answered. This report must be answered and delivered individually at the time of entering the laboratory. At the end of the practical session, the students must take a test related to the content of the practice. Finally, the students will have one week to deliver a final report containing the results obtained and the main conclusions of the practice.

TUTORSHIP SESSIONS

In general, it is a voluntary activity (individual or collective) conducted in response to students’ request. However, throughout the course a series of voluntary group deliverables will be proposed that will require attendance at tutorials.

NON-PRESENTIAL ACTIVITIES (135 h)

Continued work of student is essential to develop the competences of the subject. In addition to preparing the written exams, students should devote the hours of non-presential teaching to:

o Complete notes, consult bibliography and solve questions and/or problems, including voluntary deliverable tasks (a time commitment of approximately 3-4 h per week).

o Prepare the laboratory sessions (a time commitment of 1.5-2.0 h to prepare the laboratory practice and answer a set of preliminary questions per practice) and complete the corresponding report (2.0-3.0 h commitment per practice).

If the extraordinary circumstances derived from the current public health emergency situation caused by the outbreak of COVID-19 oblige to develop online teaching, all media available in the UPV/EHU (Windows Teams, eGela, etc.) will be used.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	45		30	15					
Horas de Actividad No Presencial del Alumno/a	67,5		45	22,5					

Legend:
M: Lecture-based
S: Seminar
GA: Applied classroom-based groups
GL: Applied laboratory-based groups
GO: Applied computer-based groups
GCL: Applied clinical-based groups
TA: Workshop
TI: Industrial workshop
GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 70%
- Exercises, cases or problem sets 10%
- Laboratory practices 20%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

EVALUATION SYSTEM

WRITTEN TEST/EXAM (70 % of the final mark)

The written test will comprise two partial tests:

- The first test corresponds to the contents of the first four-month period and will be carried out during the month of January, coinciding with the period established by the Center to carry out the exams of the first four-month period.

-The second test will be carried out in May, coinciding with the period established by the Center to perform the exams of the Ordinary Call. In this case:

If the student has obtained a mark ≥5 in the first test, he/she will be evaluated on the contents of the second four-month period.

The final grade corresponding to the written test will be calculated as the simple average of the marks of the two tests, as long as a mark ≥4 has been obtained in the second test.

If the student has obtained a mark <5 in the first test, he/she will be evaluated on the contents of the whole subject. Moreover, the exam will be formed by two differentiated parts, belonging each one to the contents of each four-month period.

The final grade corresponding to the written test will be calculated as the simple average of the grades obtained in the 2 parts that make up the exam of the Ordinary Call, being necessary that both grades are ≥4 out of 10.

PRACTICAL ACTIVITIES (10 % of the final mark)

Practical activities will be undertaken throughout the course, such as problem solving and cases, written tests or questionnaires, amongst others.

LABORATORY PRACTICES (20 % of the final mark)

- Laboratory work: 25 %
- Presentation and evaluation of the previous deliverables: 15 %
- Evaluation test (after each lab-session): 25 %
- Presentation and evaluation of the final deliverables: 35 %

REQUIREMENTS to pass the subject:

- Complete all the laboratory practices and deliver all the previous questionnaires, post-practice evaluation tests and the final report within the deadline.

- Obtain a mark ≥5 in the final grade (obtained as a weighted average of the marks corresponding to the written test, practical activities and laboratory practices). Moreover, it is compulsory to:

o Obtain a mark ≥5 out of 10 in the written test (70 %).

o Obtain a mark ≥4 out of 10 in the laboratory practices (20 %).

o It is not necessary to obtain a minimum mark in the practical activities (10 %).

Those students who do not meet any of these requirements will be marked with a 4.0 (maximum) in the Ordinary Call regardless of the final grade obtained.

*If the extraordinary circumstances derived from the current public health emergency situation caused by the outbreak of COVID-19 oblige to develop an online evaluation, all media available in the UPV/EHU (Webex, eGela, etc.) will be used. The characteristics of this new evaluation mode will be published in eGela.

CALL RESIGNATION

Those students who do not appear for the written test will be recorded as "Not Presented" in the Ordinary call.

FINAL TEST

Students who meet the conditions established in the UPV/EHU regulations and request to take a final test within the deadline set for that purpose (Chapter II, Article 8 of the Agreement of December 15, 2016, of the Governing Council of the University of the Basque Country/Euskal Herriko Unibertsitatea, which approves the Regulations governing the students’ Evaluation in official Bachelor's degrees), they need to implement the following activities:

- A written test related to the theoretical-practical contents of the subject (80 % of the final grade).

- A practical laboratory exam (20 % of the final exam).

REQUIREMENTS to pass the subject (FINAL TEST)

Obtain a mark equal to or greater than 5 in the final grade (obtained as the weighted average of the marks corresponding to the written test and the practical exam).

*If the extraordinary circumstances derived from the current public health emergency situation caused by the outbreak of COVID-19 oblige to develop an online evaluation, all media available in the UPV/EHU (BlackBoard Collaborate, eGela, etc.) will be used. The characteristics of this new evaluation mode will be published in eGela.

CALL RESIGNATION

Those students who do not appear for the final test will be recorded as "Not Presented" in the Ordinary call.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The evaluation criteria in the extraordinary call will be:

- A written test formed by the following characteristics:

If the student has obtained a mark ≥5 in the exam related to the theoretical-practical contents of the first four-month period (mark obtained in the Call of January or May, with a weight of 40 % of the final grade of the Extraordinary call) and <5 in the exam related to the theoretical-practical contents of the second four-month period (mark obtained in the call of May), in the exam of the Extraordinary Call the student will be evaluated on the contents of the second four-month period. In this case, the exam will have a weight of 40 % of the final grade.

The final grade corresponding to the written test will be calculated as the simple average of the marks of the two tests, as long as a mark ≥4 has been obtained in the Extraordinary call exam.

If the student has obtained a mark <5 in the exam related to the theoretical-practical contents of the first four-month period (mark obtained in the Call of January or May) and ≥5 in the exam related to the theoretical-practical contents of the second four-month period (mark obtained in the call of May, with a weight of 40 % of the final grade of the Extraordinary call), in the exam of the Extraordinary Call the student will be evaluated on the contents of the first four-month period. In this case, the exam will have a weight of 40 % of the final grade.

The final grade corresponding to the written test will be calculated as the simple average of the marks of the two tests, as long as a mark ≥4 has been obtained in the Extraordinary call exam.

If the student has obtained a mark <5 in the exams related to the theoretical-practical contents of both four-month periods (both in the January and May calls), in the exam of the Extraordinary Call the student will be evaluated on the theoretical-practical contents of the whole subject. In this case, the exam will have a weight of 80 % on the final grade.

The final grade corresponding to the written test will be calculated as the simple average of the grades obtained in the 2 parts that make up the exam of the Extraordinary Call, being necessary that both grades are ≥4 out of 10.

- A practical laboratory exam (20 % of the final exam). A student will be exempt from this exam if all the laboratory practices throughout the course are completed and a mark ≥4 is obtained; this grade will have a weight of the 20 % of the final grade.

REQUIREMENTS to pass the subject

Obtain a mark ≥5 in the final grade (obtained as the weighted average of the marks corresponding to the written test and the practical exam or laboratory practices).

*If the extraordinary circumstances derived from the current public health emergency situation caused by the outbreak of COVID-19 oblige to develop an online evaluation, all media available in the UPV/EHU (BlackBoard Collaborate, eGela, etc.) will be used. The characteristics of this new evaluation mode will be published in eGela.

CALL RESIGNATION

Those students who do not appear for the written test will be recorded as "Not Presented" in the Extraordinary call.

MANDATORY MATERIALS

Collections of problems and specific questions related to the subject.

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NOMENCLATURE OF INORGANIC CHEMISTRY

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LABORATORY PRACTICES

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Detailed bibliography

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o Ghasem, N.; Henda, R. (2009). Principles of Chemical Engineering Processes. Editorial Taylor & Francis Group.

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Journals

Web sites of interest

http://www.egela.ehu.es

http://www.ptable.com/?lang=es

https://www.luc.edu/media/lucedu/sustainability-new/pdfs-biodiesel/Biodiesel%20Curricula%20-%20Version%205.0.pdf

OBSERVATIONS

Universidad del País Vasco Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty 163 - Faculty of Engineering - Vitoria-Gasteiz **Cycle** .

Degree GDIMEL10 - Doble Grado en Ingeniería Mecánica + Ingeniería Electrónica Ind **Year** Second year

COURSE

25984 - Applied Mechanics **Credits, ECTS:** 9

COURSE DESCRIPTION

DESCRIPTION AND CONTEXTUALIZATION OF THE SUBJECT.

The objective of Applied Mechanics is to establish knowledge and skills related to the Statics, Kinematics and Dynamics of rigid solids.
These ideas will serve as a scientific-technical basis for the engineers in the industrial area.
Applied Mechanics has a very close relationship with Physics and Mathematics, and will serve to broaden the physical sense of the students. The course will serve to develop the analytical ability to divide a problem into simpler parts, so that once the parts are understood to be able to solve the problem as a whole. The concepts of this subject are within the field of vector calculus and matrix algebra, so the skills acquired in the Physics, Calculus and Algebra subjects will be necessary to be able to solve the problems numerically and symbolically

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

COMPETENCES / LEARNING OUTCOMES OF THE SUBJECT.

The object of the course is to establish the precise knowledge and skills on the statics, kinematics and dynamics of rigid solids, which serve as the basis for the disciplines that incorporate the theory of mechanisms and machines and the resistance of materials. Intimately connected with physics and mathematics, mechanics should contribute to increase the physical and practical sense of the students, providing them with a synthetic analytical capacity that allows them to decompose problems into simple parts and then relate them, once they have been established dependencies.

The learning Outcomes of the Subject Matter:
- C.1 Be able to analyse mechanical phenomena in the field of statics, kinematics and dynamics.
- C.2 Be able to choose the most appropriate and efficient resolution tools to solve mechanical problems in the previous field and under the rigid body hypothesis.
- C.3 Be able to assess the need for simplification of the real system and the adequacy of mathematical models of mechanical systems.
- C.4 Be able to interpret the results of mechanical analyzes and their adaptation to reality.
- C.5 Be able to distribute, interact and present a problem, its resolution and its results in a working group orally and in writing

Theoretical and Practical Contents

THEORETICAL AND PRACTICAL CONTENTS

Topic 1 VECTORS Assuming prior knowledge of the concept of vector, we will focus basically on the study of vector systems.
Topic 2 GEOMETRY OF MASSES Distribution of matter in geometric spaces through the concepts of center of mass and first and second order moments.
Topic 3 STATICS Concept of equilibrium in mechanical systems. Active forces and bonding forces, smooth bonds and rough bonds.
Topic 4 KINEMATICS Concept of position, velocity and acceleration. Relative motion. Kinematics of the rigid body. Kinematics of systems composed of rigid solids.
Topic 5 DYNAMICS Laws of dynamics. Theorems of dynamics, for the point and for material systems.
Topic 6 INTRODUCTION TO THE STUDY OF THE RESISTANCE OF MATERIALS Tension and deformation states. Traction and compression. Cortadura and its applications. General theory of bending.

TEACHING METHODS

METHODOLOGY

In the theoretical classes the theory will be explained and related examples will be solved.
In the classroom practices can explain theoretical concepts and propose exercises to develop.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	60		30						
Horas de Actividad No Presencial del Alumno/a	90		45						

Legend: M: Lecture-based | S: Seminar | GA: Applied classroom-based groups | GL: Applied laboratory-based groups | GO: Applied computer-based groups | GCL: Applied clinical-based groups | TA: Workshop | TI: Industrial workshop | GCA: Applied fieldwork groups

Evaluation methods

- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 80%
- Exercises, cases or problem sets 20%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

ORDINARY CALL.

Evaluation is based on a continuous frame as follows:
The written tests to develop are detailed below:

Three partial exams:
1) Vectors. Static
2) Kinematics.
3) Mass geometry. Dynamic. Introduction to the resistance of materials.

The passing of each partial releases the subject. Students will sit for the non-passed parts in the final exams.

The final grade of the exams will be the average of the three parts.
Who does not appear to the final exam, will obtain a grade of not presented.

The deliverables to be performed will consist of different tasks that will be described throughout the course. Some must be done individually, others in a group. Some of them will be face-to-face and will be held in class and others will be non-face-to-face.

In the event that a face-to-face assessment of the subject cannot be carried out, the pertinent changes will be made to carry out an on-line assessment by using the existing IT tools at the UPV / EHU. The characteristics of this online assessment will be published in the student guides and in eGela

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

EXTRAORDINARY CALL

The final exams will be attended with pending material.
The final mark of the exams will be the average of the three parts, with a minimum of 5 for each exam.
Whoever does not appear for the final exam, will obtain a grade of not presented

MANDATORY MATERIALS

MANDATORY USE MATERIALS

Theory and problems explained during lectures.

BIBLIOGRAPHY

Basic bibliography

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- Apuntes del profesor
- BEER, F.P. ;RUSSELL,E. Mecánica vectorial para Ingenieros. (Tomos I y II) Edit: MacGraw-Hill
- HIGDON; STILES. Ingeniería Mecánica. (Tomos I y II) Edit: Prentice-Hall Inc.
- MERIAM, J.L. Mecánica (Tomos I y II) Edit: Reverté
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- BILBAO, A; AMEZUA, E; ALTUZARRA, O. Mecánica Aplicada: Dinámica. Edit: Síntesis.
- BASTERO, J.M.; CASELLAS, J. Curso de Mecánica Edit: EUNSA
- Manuel Vazquez. Resistencia de Materiales. Editorial: Universidad Politécnica de Madrid
- Luis Ortiz Berrocal. Resistencia de Materiales. Editorial Mc Graw Hill
- Timoshenko. Resistencia de Materiales (2 tomos). Editorial: Espasa-Calpe

Journals

Web sites of interest

http://www.vc.ehu.es/ingme

http://egela.ehu.eus

http://www.biblioteka.ehu.eus

OBSERVATIONS

Universidad del País Vasco Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty 163 - Faculty of Engineering - Vitoria-Gasteiz **Cycle** .

Degree GIEIAU10 - Bachelor's Degree in Industrial Electronics and Automation Engine **Year** Fourth year

COURSE

25988 - Environmental Technologies **Credits, ECTS:** 6

COURSE DESCRIPTION

The objective of the course "Environmental Technologies" is to acquire the basic concepts of environmental pollution and solutions to pollution in the biosphere in the three main natural resources, that are, air, water and soil. This subject shall permit a sufficient knowledge to develop your professional activity in the Engineering field in various sectors of industry.

The subject has no prerequisites. However, due to its characteristics, it is convenient that the matriculated students have already coursed "Chemical Basics of Engineering" imparted in the first course.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

SPECIFIC SKILLS
S.S.1. Know the concepts of environmental pollution and sustainability..
S.S.2. Identify, state and understand the global problems of water, air and waste, as well as their influence on the environment.
S.S.3. Applications of environmental pollution concepts and prevention and control technologies to air, water, and soil pollution problems as well as to environmental quality.
S.S.4. Ability to solve problems in the industrial technology field with initiative, decisión-making, creativity, using critical reasoning and being able to communicate and transmit the knowledge, skills and abilities acquired.
S.S.5. Know and understand how to apply the legislation related to the environment.
S.S.6. Analyze and anticipate the most important risks associated with the chemical industry (and related industries).
TRANSVERSAL SKILLS
T.S.1. Work in multidisciplinary environments.
T.S.2. Ability to collect, understand and interpret information related to environmental technologies in a scientific and technical mode and using appropriately the main bibliographic sources.
T.S.3. Responsible and orderly attitude at work and predisposition to learning.

Theoretical and Practical Contents

TOPIC 1. INTRODUCTION: THE ENVIRONMENT AND POLLUTION
TOPIC 2. ATMOSPHERIC POLLUTION (AIR)
2.1. Atmosphere. Composition and structure
2.2. Energy balance of the atmosphere
2.3. Air pollution process
2.4. Air pollutants
2.5. Air quality
2.6. Effects of air pollution
2.7. Techniques for reducing and controlling air industrial emissions
TOPIC 3. WATER POLLUTION
3.1. Nature and properties of water
3.2. Origin of water contamination
3.3. Water pollutants and effects
3.4. Surface water quality
3.5. Water and wastewater treatments.
TOPIC 4. SOIL POLLUTION AND URBAN WASTE
4.1. Soil properties and pollutants
4.2. Waste
4.3. Soil decontamination techniques

TEACHING METHODS

The methodology proposed for this subject is an active methodology that implies that the scheduled activities allow students to participate in the construction of their knowledge and acquire more responsibility.
The communication and relationship between teachers and students is carried out through the following ways:
· Lectures and classroom practices.
· Use of eGela. In this platform the students have at their disposal all the necessary information and the news are posted in eGela. Throughout the course and depending on the proposed work, forums will be opened for the exchange of information.
· Tutorials

Except for the tests and the written examination, the activities developed by the students are part of the cooperative work, in which the students work in groups.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	45		15						
Horas de Actividad No Presencial del Alumno/a	67,5		22,5						

Legend:
M: Lecture-based
S: Seminar
GA: Applied classroom-based groups
GL: Applied laboratory-based groups
GO: Applied computer-based groups
GCL: Applied clinical-based groups
TA: Workshop
TI: Industrial workshop
GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 70%
- Multiple choice test 15%
- Teamwork assignments (problem solving, Project design) 15%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

MIXED EVALUATION

The evaluation will consist of the following activities:

a) Written examination (70 % of the final mark)
b) Multiple choice tests (15 % of the final mark)
c) Group Works (15 % of the final mark)

The final mark is obtained by applying these percentages to the results of the evaluation in each of the concepts indicated above, taking into account the following REQUIREMENTS:

i) Carry out all the established activities within the set deadline.
ii) Obtain a minimum score of 3.5/10 in each of the global evaluation activities.
iii) A final mark of 5.0/10.

Whether any requirement is not met, the subject will be suspended in the ordinary examination with a final mark of 4.0, regardless the results obtained in the activities.

EVALUATION INSTRUMENTS

The evaluation instrument for each activity is a rubric or evaluation matrix, which will detail the criteria and indicators used to evaluate the achievement of the competencies. All evaluation instruments are published in eGela.

The multiple-choice tests, which will be performed via eGela or in class, positive answers will add 1 point and negative answers will reduce 0.25 points. Group work will be evaluated by the teacher by means of a rubric.

FINAL EVALUATION

Students who do not opt for the MIXED evaluation system described above will take a final exam that will include theoretical questions and problems. In order to pass the subject it will be necessary to obtain a minimum mark of 5.0/10 in this exam.

Apply for the final evaluation system:

If the student does not wish to participate in the continuous evaluation system, he/she must submit to the teacher the resignation of the continuous evaluation, for which he/she will have a period of 9 weeks, counting from the beginning of the four-month period, in accordance with the academic calendar of the center (Article 8.3 Regulations governing the evaluation of students in official undergraduate degrees, UPV/EHU). Applications will not be accepted by other ways, nor after the deadline.

RESIGNATION OF THE EVALUATION CONVOCATION

In the case of continuous evaluation, students may resign the call for assessment within a period that, at least, will be up to one month before the end of the teaching period of the subject. This resignation must be submitted in writing addressed to the teacher responsible of the subject. Resignations will not be accepted by other ways, nor after the deadline. However, in the case of a final evaluation, non-presentation of the previously established individual exams will imply the automatic resignation of the corresponding call (Article 12 Regulations governing the evaluation of students in official undergraduate degrees, UPV/EHU).

In the event that it is not possible to carry out a presential evaluation of the subject, the pertinent changes will be made for the realization of an online evaluation through the use of the existing computer tools in the UPV/EHU.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

In the extraordinary call, the evaluation process of the students is the same, being in both cases a final exam.
The final exam will consist of theoretical-questions and problems about the contents of the subject. In order to pass the subject, the minimum mark in this test will be 5/10.
The RESIGNATION procedure for the extraordinary call for evaluation of the students consists of NOT presenting to the final exam.

MANDATORY MATERIALS

Contents of the subject matter are provided by the professor through eGela.

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Rodríguez, J.J., Irabien, A. "Los residuos peligrosos. Caracterización, tratamientos y gestión". Editorial Síntesis, Madrid (1999).

Seoánez, M.; Angulo, I. "Manual de gestión medioambiental en la empresa. Sistemas de gestión medio ambiental, auditorías medioambientales, evaluaciones de impacto ambiental y otras estrategias". Editorial Mundi-Prensa, (1999).

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Santiago, I. "Intoxicación por gases". Anales Sis. San. Navarra, 26(1), pp.173-180 (2003).
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Journals

Ingeniería del Agua

Tecnología del Agua

Química Industrial

Biomass and Bioenergy

Enviromental Engineering Science

Web sites of interest

Legislación UE

http://europa.eu/pol/env/index_es.htm

Ministerio de Agricultura, Alimentación y Medio Ambiente: Prevención y Gestión de Residuos
http://www.magrama.gob.es/es/calidad-y-evaluacion-ambiental/temas/prevencion-y-gestion-residuos/default.aspx

Gobierno Vasco: Medio ambiente
http://www.ingurumena.ejgv.euskadi.net/r49-home/es

IHOBE: Sociedad pública vasca de medio ambiente
http://www.ihobe.net/

Instituto Nacional de Seguridad e higiene. Ministerio de Empleo y Seguridad Social
http://www.insht.es/portal/site/Insht/

European Environment Agency EEA. Spatial analysis of green infrastructure in Europea
http://www.eea.europa.eu/publications/spatial-analysis-of-green-infrastructure

OBSERVATIONS

Universidad del País Vasco — Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty 163 - Faculty of Engineering - Vitoria-Gasteiz **Cycle** .

Degree GIEIAU10 - Bachelor's Degree in Industrial Electronics and Automation Engine **Year** Third year

COURSE

25992 - Analog Electronics **Credits, ECTS:** 6

COURSE DESCRIPTION

This course aims to analyze and design systems oriented towards the use of electrical signals, generally for the purpose of processing information. Additionally, it addresses the need to deepen the understanding of electronic devices and their efficient use.

The course builds on the knowledge acquired in the Industrial Electronics course from the second year, delving deeper into these concepts and complementing them. It also utilizes the knowledge taught in the Electrical Technology course. Therefore, a solid understanding of the subjects covered in these courses is essential for adequately following this course.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

Passive and active devices. Electronic components. Analog systems (calculation and design).

Theoretical and Practical Contents

1. Introduction
2. Amplifiers
 2.1 Introduction to Amplification
 2.2 Basic Amplifier Stages
 2.3 Frequency Response
 2.4 Output Stages
3. Analog Integrated Circuits
 3.1 Basic IC Structures
 3.2 Differential Amplifier
4. Operational Amplifiers
5. Voltage Regulators

TEACHING METHODS

Lectures and laboratory sessions.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	45			15					
Horas de Actividad No Presencial del Alumno/a	67,5			22,5					

Legend:
M: Lecture-based — S: Seminar — GA: Applied classroom-based groups
GL: Applied laboratory-based groups — GO: Applied computer-based groups — GCL: Applied clinical-based groups
TA: Workshop — TI: Industrial workshop — GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 80%
- Exercises, cases or problem sets 20%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The theoretical content will be supported by illustrative examples presented during lectures, and a collection of problems will be provided to reinforce the concepts covered in the theoretical classes. In this regard, the use of tutorials is highly recommended to address any difficulties that may arise in solving these problems.

Additionally, six practical sessions will be conducted, designed to support the theoretical content and to familiarize students with the electronic environment for signal processing and analysis. The practical sessions will always cover topics previously addressed in the theory.

A written exam will be conducted during the exam period. The final grade will consist of 80% from the written exam and 20% from the practical sessions. To calculate the average, it is necessary to obtain more than five out of ten in the written

exam and more than five out of ten in the practical sessions.

If a student scores more than five in the written exam but fails the practical sessions (or has not completed them), it will be possible to take a practical exam arranged with the professor. Not attending the written exam will be evaluated as Not Present, even if the practical sessions have been completed.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The extraordinary examination session will follow the same criteria as the regular session.

MANDATORY MATERIALS

Practical scripts and information available on the course's Egela platform.

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Pearson Educación, 2003

-AMPLIFICADORES OPERACIONALES Y CIRCUITOS INTEGRADOS LINEALES: TEO RIA Y APLICACION
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Floyd
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Jaeger, Blalock
Mc Graw-Hill 2ª ed. 2005

CIRCUITOS MICROELECTRÓNICOS
Sedra, Smith
Mc Graw-Hill, 5ª ed. 2006

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Boylestad, Nashelsky
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Journals

Web sites of interest

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OBSERVATIONS

Universidad del País Vasco — Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty 163 - Faculty of Engineering - Vitoria-Gasteiz **Cycle** .

Degree GIEIAU10 - Bachelor's Degree in Industrial Electronics and Automation Engine **Year** Third year

COURSE

25993 - Digital Electronics **Credits, ECTS:** 6

COURSE DESCRIPTION

The main objective of this subject is to achieve a basic level of knowledge in digital electronics and set the basis to be able to design complex digital circuits. It is imperative to have passed second year electricity and electronic related subjects and to be taking analog electronics.
Knowledge and competencies acquired in this subject are essential to face the following subjects: Digital Electronics Design, Embedded Systems and Microlectronics.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

The following competencies from the degree verified report will be developed:
C3 – Knowledge on basic and technologic topics, which will allow learning new methods and theories providing versatility to adapt themselves to new situations.
C4 – Capability to solve problems with initiative, decision-making, creativity, critic thinking and to convey and transmit knowledge and skills in engineering fields.
C6 – Capability to handle specifications, regulations and rules of mandatory compliance.
C10 – Capability to work in a multidisciplinary and multilingual environment
TEEOI3 – Knowledge of the foundation and applications of electronic circuits and microcontrollers.
As outcome of the development of the aforementioned competencies the following results are expected:
- Select the most suitable integrated circuit for a specific design.
- Apply knowledge of basic electronic components to develop digital electronics applications.
- Formulate ideas, discuss and make viable technological decisions in team work in the field of electronic engineering disciplines.
- Apply the legislation, specifications, regulations and mandatory standards in the field of electronic engineering.

With what you will get:
- The ability to design a digital system, both at the level of integrated circuits available on the market, and at the level of own design of functional blocks.
-The ability to select the most suitable integrated circuit for a specific design.
-The ability to analyze any type of integrated circuit, based on its data sheets.
-The ability to analyze and detect errors in any combinational digital circuit.

Theoretical and Practical Contents

0.- Introduction
1.- Transistor in switching mode
2.- Number systems and codes
3.- Boole algebra
4.- Combinational circuits
5.- Sequential circuits
6.- Logic families
7.- Programmable logic devices
8.- Hardware description languages
9.- Memories
10.- High speed digital design considerations
Demonstrations:
Transistor in switching mode
Inverter transfer function
VHDL: Synthesis and simulation
Multiplexers, decoders andtransmission gates
VHDL: Combinational circuits
VHDL: Sequential circtuis, PWM
VHDL: State machines

TEACHING METHODS

Master classes introducing the required concepts to lead the learning process will be carried out. Active participation of the students will be fostered. Simultaneously to the introduction of new circuits in the classical way, the representation of the same circuits using hardware description languages will be introduced.
Practical laboratory demonstrations in small groups will take place to implement different digital circuits. The demonstrations will be coordinated with the lectures so that the students can experience the concepts given in class. In

some demonstrations, the student will be requested to submit a previous work.
If no physical access to the laboratory is allowed, demonstrations will be replaced by simulation exercises and remote laboratories.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	45			15					
Horas de Actividad No Presencial del Alumno/a	67,5			22,5					

Legend:
M: Lecture-based
S: Seminar
GA: Applied classroom-based groups
GL: Applied laboratory-based groups
GO: Applied computer-based groups
GCL: Applied clinical-based groups
TA: Workshop
TI: Industrial workshop
GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 80%
- Individual assignments 20%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

One written exam accounts for 80 % of the final mark. Attendance to the demonstrations is compulsory and one additional practical exam should be taken in the case that attendance and/or the academic progress is not fulfilled.
A compulsory individual work focusing on the development and synthesis of digital circuits using hardware description languages should be submitted. It will account for 20 % of the final mark as long as at least 4.5 points are obtained in the written exam. Failing this work prevents the students from passing the subject regardless the result in the written exam.
In order to renounce this call the student only needs not to take the written exam.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The same rules apply to the second call.

MANDATORY MATERIALS

Lecture presentations available in eGela platform need to be coplemented with notes taken by the student
VIVADO Webpack

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Tomo 3. Digitales I, 4ª ed. 1986
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Principios y aplicaciones
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E. Mandado, J.L. Martín
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Journals

Web sites of interest

http://www.cypress.com/
http://www.ti.com/
http://www.st.com/stonline/
http://www.onsemi.com/

OBSERVATIONS

In the evaluation tests, only non-programmable scientific calculators are allowed to be used. If the device is programmable the calculator will be retired and no additional device will be allowed, even if it fulfills the requirements.
In case cheating is detected, the protocol about academic ethic issued by the University of the Basque Country will be followed.

Universidad del País Vasco — Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty	163 - Faculty of Engineering - Vitoria-Gasteiz	**Cycle**	.
Degree	GIEIAU10 - Bachelor's Degree in Industrial Electronics and Automation Engine	**Year**	Third year

COURSE

25994 - Power Electronics — **Credits, ECTS:** 6

COURSE DESCRIPTION

Power Electronics aims at the processing of energy as opposed to the processing of information, which is the goal of conventional electronics. To achieve this objective, the following steps will be taken:
- Study the issues associated with the conversion and control of electrical energy.
- Present the specific methods used in the analysis and design of power converters.
- Analyze the switching characteristics of semiconductor devices with high energy levels.
- Analyze and design power converters.
- Show real applications where the techniques studied in the conversion of electrical energy are applied, with special attention to applications in renewable energy or electric mobility.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

1.- Understand the issues that create the need to apply power electronics techniques.
2.- Examine the different applications of power electronics and the systems used in each application.
3.- Study the various types of converters used in power electronics.
4.- Understand and know how to apply the specific analysis techniques for each type of converter.
5.- Understand the control techniques for each function in this area and the methods applied, as well as the circuitry and available commercial ICs.
6.- Study the specific electronic components used in the control of electrical energy and their behavior in the context of power circuits.
7.- Learn to choose the most suitable solution among the various solutions provided by power electronics for the control of machines and electrical systems.
8.- Appreciate the importance of power electronics techniques in solving problems and advancing alternative energies.

Theoretical and Practical Contents

The index to be followed to achieve the proposed objectives is:
Topic 1: An Overview of Power Electronics
Topic 2: AC/DC Conversion - Rectifiers
- Specifications
- Uncontrolled
- Switches: Diodes
- Controlled
- Thyristors
- Static DC switches with SCR

Topic 3: DC/DC Conversion - Switched-mode power supplies
- Basic topologies
- BJT, MOSFET, IGBT in switching
- Isolated converters. Switched-mode power supplies
- Control techniques

Topic 4: DC/AC Conversion - Inverters
- Square wave inverters
- PWM inverters
- Three-phase inverters

Topic 5: AC/AC Conversion
- Regulators
- Static AC switches
- Cycloconverters

Topic 6: Applications and Solutions in Alternative Energies

TEACHING METHODS

Lectures and laboratory sessions.
Lectures will provide the necessary knowledge for the proper development of the learning process. Active student participation in class will be encouraged with specific questions on the topic being discussed. The presentation of power electronics analysis tools will be carried out in parallel and transversally.
Laboratory practice classes will be conducted in small groups and will focus on implementing practices with power converters. The practical sessions will be coordinated with the delivery of theoretical concepts, allowing students to experience the knowledge acquired. In some practical sessions, students will be required to present a preliminary study of the practice.
If access to laboratories is not possible, the practical sessions will be conducted through simulations.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	45			15					
Horas de Actividad No Presencial del Alumno/a	67,5			22,5					

Legend: M: Lecture-based | S: Seminar | GA: Applied classroom-based groups | GL: Applied laboratory-based groups | GO: Applied computer-based groups | GCL: Applied clinical-based groups | TA: Workshop | TI: Industrial workshop | GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 80%
- Exercises, cases or problem sets 20%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

A written exam will be conducted during the exam period.
The final grade will consist of 80% from the written exam and 20% from the practical sessions.
To calculate the average, it is necessary to obtain more than 4.5 in the written exam and more than 5.0 in the practical sessions.
If a student scores more than five on the written exam but fails or has not completed the practical sessions, it will be possible to take a practical exam by arranging it with the professor.
Failure to attend the written exam will be evaluated as Not Presented, even if the practical sessions have been completed.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The extraordinary examination session will follow the same criteria as the regular session.

MANDATORY MATERIALS

- Theory guides
- Practical work statements
- Practical guides

These materials will be available on the eGela page of the course.

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OBSERVATIONS

During evaluation tests, only non-programmable scientific calculators are allowed. If a programmable calculator is used, it will be confiscated, and no other device will be permitted even if it meets the established requirements.
If cheating is detected, the academic ethics protocol published by the University of the Basque Country will be followed.

COURSE GUIDE 2024/25

Faculty 163 - Faculty of Engineering - Vitoria-Gasteiz **Cycle** .

Degree GIEIAU10 - Bachelor's Degree in Industrial Electronics and Automation Engine **Year** Third year

COURSE

25995 - Electronic Instrumentation **Credits, ECTS:** 6

COURSE DESCRIPTION

The subject of Electronic Instrumentation is interdisciplinary in nature and is part of the Specific Module of Industrial and Automation Electronics Technology, which also includes: Analog Electronics, Digital Electronics, Power Electronics, Digital Electronic Systems, Industrial Automation, Industrial Informatics, Robotics, Automatic Control, and Electronic Technology.

For this reason, it is important to provide students with adequate knowledge to assimilate and deepen other subjects of the degree, while also properly analyzing aspects introduced in other subjects but which have their own peculiarities. These prerequisite knowledge areas can be classified as follows:

·Subjects coexisting temporally: Digital Electronic Systems, Robotics, and Industrial Automation.
·Subjects from previous courses: Fundamentals of Electrical Technology, Industrial Electronics.
·Previous subjects from the same course: Analog Electronics, Digital Electronics, and Electronic Technology.
This subject addresses the study of electronic circuits and systems applied in the measurement, monitoring, and recording of various physical quantities in industrial electronic systems.

Electronic Instrumentation is the part of electronic technology that deals with the measurement of any physical quantity in the real world (temperature, light, level, etc.), its conversion into electrical quantities, and its processing using electronic systems to provide suitable information to a monitoring/control system, a human operator, or any combination thereof. Electronic sensors are used for this purpose to measure different quantities present in nature, along with the appropriate design of electronic circuitry associated with the sensors so that the obtained signal is easy to use by control electronic systems.

Electronic Instrumentation finds its application in numerous activities related to the industry where electronics has been massively incorporated and is intensively used (any automated production system is a good example of this). Moreover, it is also commonly used in our daily lives. For example, the increasing presence of electronics in modern cars (ABS, rain sensors, etc.), or in our homes (fire/smoke detection systems, temperature control, etc.).

The work carried out by students in this subject will provide them with knowledge about widely used electronic sensors in the industrial field, as well as the design of electronic circuitry for the specific treatment of signals collected with sensors.

The subject of Electronic Instrumentation can be seen as a natural continuation of the study of systems for measuring physical quantities by electronic means, which has already been partially addressed in the Electronic Technology subject in the first semester of the third year of the Degree in Industrial and Automation Electronics Engineering.

Furthermore, in this subject, the fundamentals of general electronics, analog electronics, and digital electronics acquired in previous degree subjects (Industrial Electronics, Analog Electronics, and Digital Electronics) are applied, and solid foundations of physics, mathematics, and fundamental technologies (subjects from the first and second year) must be established. It is also beneficial to have prior knowledge of a programming language (Industrial Informatics subject in the first semester). Any deficiency in these prerequisite knowledge areas should be addressed as soon as possible with additional effort in order to progress with the subject.

In the same semester, subjects such as Power Electronics and Digital Electronic Systems are taught. It is also positive to establish relationships with these subjects since a typical electronic system combines aspects of signal capture and processing (Electronic Instrumentation), digital processing (Digital Electronic Systems), and energy conversion or actuation (Power Electronics).

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

Specific Competence to be acquired with the subject: "Applied Knowledge of Electronic Instrumentation"
SPECIFIC SUBCOMPETENCIES
I1. Identify and rigorously employ concepts such as: Magnitude, variable, signal, noise, signal-to-noise ratio, etc., and those related to the properties of a measurement: error, accuracy, precision, truthfulness, uncertainty.
I2. Demonstrate knowledge of instrumentation amplifiers applicable in the amplification of signals derived from sensors at the level of analysis, specification, and design of these circuits.
I3. Demonstrate the ability to design active filter circuits applicable in the conditioning of signals derived from sensors and instrumentation.
I4. Differentiate and explain the fundamental processes (sampling, discretization, etc.) involved in the conversion of analog signals into digital variables, the imperfections and errors that can be generated in these processes, and the applicable

techniques to keep these errors limited.
I5. Demonstrate knowledge of analog-to-digital conversion techniques and the characteristics to consider in the choice of a specific analog-to-digital conversion device or circuit.
I6. Define and develop virtual instrumentation applications using the Labview environment.
I8. Differentiate and explain the principles and techniques of digital processing and data communication applicable in instrumentation systems.
I9. Differentiate and explain the types of interferences that can affect an instrumentation system, their origin, coupling paths, and effects on the system, and the applicable techniques to mitigate those negative effects on the system.
I10. Handle with ease and judgment the most common instruments in the industrial electronics environment. Proficiency in the use of experimental techniques of Electronic Instrumentation in the laboratory.
The following CROSS-CUTTING COMPETENCES are also worked on:
FB7 Apply the strategies of the scientific methodology to solve problems: make observations with awareness of the theoretical and interpretive framework that guides them; analyze the qualitative and quantitative problematic situation, propose hypotheses and solutions using appropriate models.
FB8 Communicate adequately the knowledge, procedures, results, skills, and inherent aspects of the basic subjects of engineering, using appropriate vocabulary, terminology, and means.
FB9 Work effectively in a group integrating capacities and knowledge to make decisions in the development of proposed tasks.
FB10 Adopt a responsible, orderly attitude in work and be willing to learn, developing resources for autonomous work.
FUNDAMENTAL LEARNING OBJECTIVES
O1. Ability to specify an instrumentation system for the capture and processing of variables associated with a physical quantity, establishing measurement properties, quality parameters, robustness, and performance.
O2. Ability to discuss, defend, and contrast that specification.
O3. Ability to design, develop, and implement an amplifier circuit, conditioning, and filtering for sensors of physical quantities.

Theoretical and Practical Contents

1. Introduction to Electronic Instrumentation: The field of application of Electronic Instrumentation will be studied, understanding its role in the overall design of electronic systems and placing special emphasis on its various fields of action.

2. Amplification: Different types of amplifiers commonly used in electronic instrumentation will be studied, as well as their limitations.

3. Sensors: Various types, characteristics, and properties of electronic transducers currently available in the market for measuring the main variables of interest governing industrial processes and their conditioning will be analyzed and studied. The improvement of signal quality collected with transducers is the object of study in this topic. The most widely used circuits in Electronic Instrumentation will be analyzed, as well as specific conditioning solutions for certain transducers.

4. Filtering: The different classifications of filters will be theoretically studied, and then the topic will focus on active analog filters.

5. Analog-Digital and Digital-Analog Conversion: Data acquisition systems. The existence of PC-based systems for process control and monitoring is based on the strategies of analog-digital and digital-analog conversion that will be analyzed in this chapter, including for this purpose commercial chips of DAC and ADC types. Errors produced in conversions will also be studied: aliasing, quantization, etc.

6. Interferences, Noise, and Electromagnetic Compatibility: This topic will provide a brief introduction to the different sources of interference and how to treat them.

During the academic year, Laboratory Practices directly related to the topics mentioned above will be developed.

One of the practices is framed within an I3KD project: A practice is proposed to analyze the problem of reading ambient temperature using different types of sensors. Depending on the range of temperatures to be measured, the more or less sudden temperature changes, or the desired precision, different sensors will be required. Students must select two or three sensors and condition them for visualization on a computer where they will be displayed in the LabVIEW environment using National Instruments technology. The results obtained for different sensors will be compared to choose the most suitable sensor. This activity will focus on Sustainable Development Goal SDG3 (Health and Well-being).

TEACHING METHODS

The teaching methodology used employs the following types of teaching: lectures, classroom practices, and laboratory practices.

Hours of laboratory practices: 15

Hours of classroom practices: 15
Hours of lectures: 30
Total hours of autonomous work: 90

In the lecture and classroom practice modalities, the teacher will deliver presentations so that theoretical concepts are assimilated by the students in the most natural way possible. Obviously, active teaching methodologies such as problem-based learning will also be used. Problem-solving will be carried out participatively, individually, or in groups, which will allow for a deeper understanding of the subject matter. In the laboratory practices, experimental work will be conducted to acquire knowledge and skills of the measurement techniques used in the subject. With all of this, the aim is for students to internalize their learning and ways to improve it.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	30		15	15					
Horas de Actividad No Presencial del Alumno/a	45		22,5	22,5					

Legend:
M: Lecture-based
S: Seminar
GA: Applied classroom-based groups
GL: Applied laboratory-based groups
GO: Applied computer-based groups
GCL: Applied clinical-based groups
TA: Workshop
TI: Industrial workshop
GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 80%
- Exercises, cases or problem sets 20%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The evaluation method for all students will be continuous assessment, consisting of two items: 1) 80% of the grade associated with the final exam, 2) 20% of the grade associated with attendance and active participation in laboratory practices (attendance at laboratory practices at the proposed schedule by the School is mandatory) and deliverables/assigned tasks (problems, more complex assignments) that may include oral defense. The submission of assignments is mandatory on the dates specified by the faculty.

It is mandatory to pass (obtain 50% of the points for each item) each of the two aforementioned items independently to pass the course. Failure to meet this condition will result in failing the course (final grade = the lowest of the grades corresponding to the 2 items).

When each of them is individually passed, the final grade will be obtained from the weighted sum of the grades obtained in the specified items. If the laboratory practice item is passed, the obtained grade will be retained until the extraordinary session. Similarly, if the written test part is passed, its grade will be retained for the extraordinary session.

In case of NOT ATTENDING laboratory practices and/or NOT SUBMITTING the proposed assignments on time, the course will be failed regardless of the grade the student may obtain in the exam (final grade = 1 point).

If a student participates in continuous assessment during the course but does not take the final exam, their grade will be failed, and it will correspond to the weighted sum of the items considering a grade of 0 in the final exam item.

If any student wishes to opt for the final evaluation, they must submit to the theory professor within the first nine weeks of the semester a signed printed document indicating their intention to take this final exam. This final exam will assess all competencies. It consists of an exam covering the entire course and must be passed as a whole. After passing this exam, a laboratory exam will be conducted, which will include LabVIEW programming and handling of electronic instrumentation devices, as well as the presentation of an instrumentation project carried out by themselves.

In case sanitary conditions prevent the carrying out of face-to-face teaching and/or evaluation activities, a non-face-to-face modality will be activated, of which students will be promptly informed.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The extraordinary assessment will be equivalent to the final assessment in the ordinary session. It consists of an exam covering the entire course, and it must be passed as a whole. After passing this exam, a laboratory exam will be conducted, which will include LabVIEW programming and handling of electronic instrumentation devices, as well as the presentation of an instrumentation project carried out by themselves.

Non-attendance to the exams in the extraordinary session implies waiving that session and will be graded as Not Present.

In case sanitary conditions prevent the carrying out of face-to-face teaching and/or evaluation activities, a non-face-to-face modality will be activated, and students will be promptly informed.

MANDATORY MATERIALS

- LabVIEW programming environment installed on the laboratory computers.
- Workstation instrumentation in the laboratory: power supplies, function generator, multimeter, oscilloscope, and data acquisition card installed on the computer, with control from LabVIEW.
- Datasheets and application notes from manufacturers recommended in classes.
- Course materials available on the eGELA platform, including documentation for the course and a complete program of practical activities.

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3. Balcells y otros. "Interferencias electromagnéticas en sistemas electrónicos". Editorial Marcombo.

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- www.ti.com
- www.amidata.es
- es.farnell.com
- www.ni.com
- www.ieee-ims.org

OBSERVATIONS

The approach to the subject requires basic knowledge of mathematics, physics, electricity, analog electronics, and digital electronics, which should have been acquired in previous courses or subjects from the first semester. A deficit in these knowledge areas, if not overcome with special effort at the beginning of the semester, can make it very difficult to assimilate the contents of this subject.

It is recommended to pass the subject through the regular route. The extraordinary route entails an evaluation where competency acquisition must be demonstrated in a single theoretical exam, supplemented with the completion of a practical exam and a Labview programming exam if necessary.

Universidad del País Vasco — Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty 163 - Faculty of Engineering - Vitoria-Gasteiz **Cycle** .

Degree GIEIAU10 - Bachelor's Degree in Industrial Electronics and Automation Engine **Year** Third year

COURSE

25996 - Digital Electronic Systems **Credits, ECTS:** 6

COURSE DESCRIPTION

Digital Electronic Systems is a compulsory third-year course that aims to introduce students to the design of 8-bit microcontrollers and the most common peripherals and protocols.

The types of devices mentioned are at the core of any electronic equipment manufactured today, making this course highly practical.

It is advisable to have developed the competencies acquired in Digital Electronics and Fundamentals of Computer Science to effectively tackle this course. Additionally, it serves as a starting point for the Embedded Systems and Microelectronics courses in the fourth year.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

C3 - Knowledge in basic and technological subjects, enabling them to learn new methods and theories, and providing them with the versatility to adapt to new situations.
C4 - Ability to solve problems with initiative, decision-making, creativity, critical reasoning, and to communicate and transmit knowledge, skills, and abilities in the field of Industrial Engineering.
C6 - Ability to handle specifications, regulations, and mandatory standards.
C10 - Ability to work in a multilingual and multidisciplinary environment.
TEEOI3 - Knowledge of the fundamentals and applications of digital electronics and microprocessors.

As a learning outcome, students will be able to:
Design and synthesize digital systems based on microprocessors and microcontrollers.

Theoretical and Practical Contents

The theoretical topics covered are:
- 8051 Architecture
- Code and data memory
- Interrupts and integrated peripherals
- 8051 Programming in assembly language
- Asynchronous communications RS232 and RS485
- Synchronous communications I2C and SPI
- I/O peripherals: key matrices, LCDs
- Voltage supervisors and watchdogs

The laboratory practices are as follows:
- IDE and code generation
- Debugging/simulation
- Functions and loops
- GPIOs
- Stepper motor
- Audio generation
- Serial port
- Control of an alphanumeric LCD
- Control of an I2C LED driver
- Reading a 4x4 keyboard

TEACHING METHODS

In lectures, the focus is on enhancing knowledge of basic subjects and technologies that enable learning new methods and facilitate adaptation to new situations. This will be supported by handling specifications and standards published by manufacturers and consortia.

Datasheets and manuals of the studied peripherals will be used as a guiding thread. Based on these, relevant explanations will be provided so that simple implementations demonstrating the discussed functionality can be carried out in practical sessions.

In practical classes, this documentation will be used to solve problems with initiative, creativity, and critical reasoning, applying strategies typical of the scientific methodology. Students will develop skills in interpreting electronic schematics and handling laboratory instruments used in assembling printed circuit boards.

If health conditions prevent in-person teaching and/or evaluation, a remote learning mode will be activated, and students will be promptly informed.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	45			15					
Horas de Actividad No Presencial del Alumno/a	67,5			22,5					

Legend:
M: Lecture-based | S: Seminar | GA: Applied classroom-based groups
GL: Applied laboratory-based groups | GO: Applied computer-based groups | GCL: Applied clinical-based groups
TA: Workshop | TI: Industrial workshop | GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Multiple choice test 50%
- Oral defence 20%
- Individual assignments 30%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

CONTINUOUS ASSESSMENT (THEORY):
- There will be 5 quizzes corresponding to the first topics, which will count towards the final grade. The average of these quizzes equals 50% of the final grade for the subject. It will not be necessary to pass all of them, but a grade higher than 5/10 is required.
- Practical assignments are mandatory. A check of the necessary previous work will be conducted before each practical session, where students must attend with a compilable version of the source code. Demonstrating the correct functionality of the assignments accounts for 10% of the final grade, and a minimum grade of 4/10 is required.
- Each student will develop an individual final project, starting from week number 11. The correct functioning and performance of the program, as well as the source code used, will be evaluated and correspond to 20% of the final grade, requiring a minimum grade of 5/10. Additionally, students will undergo an oral examination where they will defend the proper functioning of their project, explain how they programmed it, and answer questions from the faculty. This evaluation equals 20% of the final grade, and a grade higher than 5/10 is necessary.

To pass the subject, it will be necessary to exceed each of the minimum grades indicated above. Failure to do so will result in the lowest grade not meeting the minimum requirement being recorded in GAUR.

In the continuous evaluation mode, students who do not complete the continuous evaluation or do not submit the final project will be graded as NOT PRESENTED.

FINAL EVALUATION
Students who do not participate in continuous assessment will take an exam graded with 50% of the final grade for the course. This exam will contain questions to assess the competencies that should be acquired in the theoretical classes and laboratories.

If a student has not attended or passed the laboratory practices, the evaluation of that part will be altered by changing the items to be evaluated. The performance of the practices will not be evaluated, and the weight of the final project will be equivalent to 30% of the final grade, requiring a minimum grade of 5/10. In either case, students must also complete the oral exam equivalent to 20% of the final grade.

To pass the course, it will be necessary to pass each of the minimum grades indicated above. Failure to do so will result in the lowest grade not meeting the minimum requirement being recorded in GAUR.

Non-attendance at the theory exam or non-submission of the final project will be graded as NOT PRESENTED.

If health conditions prevent the conduct of face-to-face teaching activities and/or assessment, a non-presential modality will be activated, of which students will be promptly informed.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Students will have the opportunity to choose whether to maintain the grades obtained during continuous assessment or not, but only for those parts that meet the minimum grade.
- Theory exam (50%) -> 5/10
- Final project (30%) -> 5/10
- Oral exam (20%) -> 5/10

However, they may choose to waive any part they have passed and undergo the evaluation process for each part again if they deem it appropriate.

For the assessment in the extraordinary session, the same assignments assigned in the ordinary session may be submitted, following the same criteria as in it. And those students who would have preferred the final evaluation in the ordinary session will be evaluated in the same way in the extraordinary session.

MANDATORY MATERIALS

Slides/documents of the subject available on eGela. Development boards for microcontrollers. Personal computer and various software required for the development of systems based on microcontrollers.

BIBLIOGRAPHY

Basic bibliography

[01] Microcontroladores MCS-51. Apuntes de clase de Ángel Mª Aledo Amorós
[02] Prácticas Básicas con microcontroladores. Apuntes de José Miguel Gil-García

Detailed bibliography

- Microcontroladores MCS-51 y MCS-251. J. Matas y R.R. Ramos. Edicions UPC. 2001
- C and the 8051 Vol.I y II. Thomas W.Schultz

Journals

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Web sites of interest

In every chapter of [02] interesting URLs will be provided
www.embedded.com
www.8052.com

OBSERVATIONS

Only non-programmable scientific calculators may be used in assessment tests. If a programmable calculator is detected, it will be confiscated, and the use of any other device, even if it meets the established requirements, will not be allowed.

If copying is detected, the protocol on academic ethics published by the University of the Basque Country will be followed.

Universidad del País Vasco — Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty 163 - Faculty of Engineering - Vitoria-Gasteiz **Cycle** .

Degree GIEIAU10 - Bachelor's Degree in Industrial Electronics and Automation Engine **Year** Third year

COURSE

25999 - Industrial Information Technology **Credits, ECTS:** 6

COURSE DESCRIPTION

SHORT DESCRIPTION
This subject focuses on the use and application of computers in industrial environments. For it, the problem of applying computers and other intelligent devices in control applications is studied, making special emphasis on operating systems and communications. In addition, basic embedded systems concepts are introduced as well as industrial communications. These contents constitute the core of what is currently called INDUSTRY 4.0.

PREREQUISITES
This subject is based on knowledge acquired in previous subjects, therefore, it is highly recommended having previously passed them.
Most related previous subjects:
* Computer science fundamentals (1st course)
* Automation and control (2nd course)
In addition, knowledge acquired in basic subjects of Mathematics, Physics and Basic Electronics will be applied.

MAIN RELATED SUBJECTS
a) COMPULSORY SUBJECTS (3rd year):
* Automatic regulation
* Digital electronic systems
* Robotics
* Industrial automation
b) OPTIONAL SUBJECTS (4th Year):
* Embedded Systems
* Extended Industrial Information Technology
* Computer control

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

SPECIFIC COMPETENCES
1. Learn programming languages and development tools.
2. Design and implement computer-based control systems.
3. Create applications that execute the cycle: (a)Measurement, (b)Computation, (c)Actuation
4. Divide a complex problem into simpler ones
5. Design basic modules and integrate them to build complex solutions
6. Use of communications between computers (Distributed Applications)
7. Understand technical documentation (Sensors, Actuators, Communications)
8. Understand and write technical documentation related to software applications (Specifications and software documentation)

GENERIC SKILLS
9. Promote autonomous learning of new methods and theories, and the ability to adapt to new work situations.
10. Ability to solve problems with initiative, make decisions, provide creative solutions, apply critical reasoning, communicating and transmitting knowledge, skills and abilities.
11. Ability to carry out measurements, calculations, valuations, appraisals, appraisals, studies, reports, work plans and similar works.

TRANSVERSAL COMPETENCES
12. Work in multilingual and multidisciplinary environments.
13. Adopt responsible and orderly attitudes at work.
14. Apply strategies typical of scientific methodology: (a) Analyze the situation in both qualitative and quantitative way. (b) Pose hypotheses and solutions using the models specific to the engineering branch in industrial and automatic electronics.
15. Work effectively in groups integrating skills and knowledge.
16. Learn autonomously in a rapidly changing discipline (industrial computing).

Theoretical and Practical Contents

TOPIC 1. INTRODUCTION: Specific problems of control applications. Role of the computer in the control of different types of industrial systems. Comparison of centralized control vs. distributed control.

TOPIC 2. OPERATING SYSTEMS: Main functions of operating systems. Types of operating systems. Components of an operating system. Role of the Kernel. Task scheduler.

TOPIC 3. ADVANCED PROGRAMMING IN C: Variables. Flow control instructions. Features. Complex structures of data. Calls to library functions. Use of the operating system API. Decomposition of a complex problem into functions (top-down design). Unit tests. Building complex software from simpler components (bottom-up design).

TOPIC 4. EMBEDDED SYSTEMS: Introduction to concurrent programming. Programming problems in embedded systems. Execution cycle of embedded systems: (a) Data acquisition, (b) Algorithm execution control and (c) Performance.

TOPIC 5: COMMUNICATIONS BETWEEN COMPUTERS: Structuring of communications in layers. Description of the ISO OSI reference model. Description of the TCP/IP protocol stack.

TOPIC 6: INTRODUCTION TO INDUSTRIAL COMMUNICATIONS: Specific communication problems of data in industrial environments. Automation pyramid. Fieldbuses. Common networks in industrial environments.

LABORATORY: IoT APPLICATION TO ANALYZE SUSTAINABILITY IN THE EIVG: An IoT project will be developed that allows measuring and analyzing the environmental variables related to thermal comfort in the School of Engineering of Vitoria-Gasteiz within the framework of the i3KD Laborategia project (i3KD22-11).

NOTE
These topics will be developed both in the classroom through master classes and collaborative activities and in the aboratory through the execution of the project and the proposed practices (See TEACHING METHODS).

TEACHING METHODS

METHODOLOGY USED
During the development of the subject, different methodologies will be combined, which will include:

a) THEORY CLASSROOM
1. In-person theory classses
2. Collaborative activities in the classroom related to the syllabus.
3. Activities related to the proposed project.

b) LABORATORY
4. In the laboratory the Project Based Learning (PBL) methodology will be used: It will be proposed to students a project related to the subject syllabus that they must solve working in groups.
5. During the execution of the project, a set of deliverables will be required that must be delivered on time.
6. Activities related to the proposed project will be carried out in the classroom.

NOTE
In the event that health conditions do not allow it, the teaching will be adapted to be taught online according to the conditions described in eGela.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	30			30					
Horas de Actividad No Presencial del Alumno/a	45			45					

Legend:
M: Lecture-based — S: Seminar — GA: Applied classroom-based groups
GL: Applied laboratory-based groups — GO: Applied computer-based groups — GCL: Applied clinical-based groups
TA: Workshop — TI: Industrial workshop — GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 50%
- Exercises, cases or problem sets 50%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

EVALUATION DETAILS

A. CONTINUOUS EVALUATION
1. INDIVIDUAL EXAMS: (50%)
C programming exam (eliminatory): 25%
Final exam (eliminatory): 25%
2. DEVELOPMENT OF THE PROPOSED PROJECT (50%)
Evaluation of the requested reports (some activities can be carried out in the classroom): 15%
Deliverables (duly commented code, technical documentation, etc.) of the proposed project: 35%

NOTES FOR CONTINUOUS EVALUATION
1. It is mandatory to carry out the project proposed by the teaching staff to pass the subject.
2. It is mandatory to attend successfully at least 80% of the laboratory sessions to achieve a continuous assessment.
3. The completion of the project requires the timely delivery of the requested deliverables within the deadlines indicated in eGela.
4. In the middle of the course there will be an individual programming exam that will be eliminatory to continue with the project development.
5. The evaluation tests will be carried out in person. In the event that the sanitary conditions do not allow it, the evaluation tests to be carried out according to the conditions described in eGela.

B. FINAL EVALUATION
In accordance with the regulations governing student evaluation in official undergraduate degrees established at the UPV/EHU, the continuous evaluation system is the one that should preferably be used at the UPV/EHU.

The final evaluation consists of the following parts: (1) written theoretical exam, (2) C programming exam and (3) the carrying out a project proposed by the teaching staff that must be delivered in advance of the exam date.
The evaluation tests will be carried out in person. In the event that sanitary conditions do not allow it the evaluation tests will be carried out according to the conditions described in eGela.

C. RESIGNATION PROCEDURE
The resignation from continuous evaluation must be presented in writing within a period of 9 weeks from the beginning of the quarter.
D. RATING
The final grade, published in the minutes, will be:
1. If passed, the weighting of all parts of the subject: (1) C programming exam (25%); (2) Final theory exam (25%) and (3) The proposed project in the laboratory (50%).
2. If any of the parts are not passed, the grade will be the minimum grade of the parts evaluated.
3. If you do not take the final exam, a grade of NOT PRESENTED will be assigned.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

According to the Regulations governing Student Evaluation in official Degree, chapter II, article 9, section 2, this type of evaluation will be carried out exclusively through the final evaluation system. The system of final evaluation contemplates the possibility of evaluating the learning results through a test, consisting of one or more exams and global evaluation activities of the subject, which will be carried out during the official period of exams.
The evaluation tests will be carried out in person. In the event that sanitary conditions do not allow it the evaluation tests will be carried out according to the conditions described in eGela.

MANDATORY MATERIALS

MATERIALS PROVIDED WITH EGELA
1. Presentation of the subject
2. Transparencies of all the material presented in the classroom related to the syllabus (Based on the electronic book "Embedded systems and industrial communications" ISBN: 978-84-693-3714-1,
3. Materials for autonomous learning of the C language. (Electronic exercise book "Computer Science Laboratory Industrial", ISBN: 978-84-693-3715-8
4. Guidelines for project development
5. Help materials for carrying out the project.

BIBLIOGRAPHY

Basic bibliography

STALLINGS, W. 2005. Sistemas Operativos. 5ª Ed. (Prentice-Hall)

KERNIGHAN, BRIAN; RITCHIE, DENNIS. 1991. El Lenguaje de Programación C. (Prentice Hall)

MARQUEZ F. M. 2004, Unix Programación avanzada, 3ª Ed, (Ra-Ma)

CASTRO, M. y otros. 2007 Comunicaciones Industriales: Principios Básicos. Ed. UNED

TANENBAUM, A.S. 2004. Redes de Computadoras. (Prentice Hall)

Detailed bibliography

BURNS, A. y WELLINGS, A. 2003 Sistemas de tiempo real y Lenguajes de Programación, Ed. Addison-Wesley Iberoamericana, 3ª Ed.

ASHENDEN, PETER J. 2008. The designer's guide to VHDL.

CASTRO, M. y otros 2007 Comunicaciones Industriales: Sistemas Distribuidos y Aplicaciones. Ed. UNED,

Journals

Revista Iberoamericana de Automática e Informática Industrial (http://riai.isa.upv.es/)
IEEE Transactions on Industrial Informatics
Computers in Industry
Control Engineering

Web sites of interest

www.ehu.es
http://en.wikipedia.org/wiki/Intel_8086 (i8086)
http://en.wikipedia.org/wiki/Ada_(programming_language) (Ada)
http://en.wikipedia.org/wiki/VHDL (VHDL)
http://es.wikipedia.org/wiki/Modelo_OSI (Comunicaciones)

OBSERVATIONS

Universidad del País Vasco Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty 163 - Faculty of Engineering - Vitoria-Gasteiz **Cycle** .

Degree GIEIAU10 - Bachelor's Degree in Industrial Electronics and Automation Engine **Year** Fourth year

COURSE

26005 - Embedded Systems **Credits, ECTS:** 6

COURSE DESCRIPTION

Embedded systems is a 4th year optional subject that pursues learning a set of modern tools. It is an eminently practical subjects studying current microcontroller architecture and tools employed in developing microcontroller based systems nowadays. It follows the 3th year starting subject about microcontrollers (Digital Electronic Systems) but focuses on 32-bit architectures, tools and stacks. It complements the subject Industrial Informatics.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

The following competencies from the degree verified report will be developed:
C3 – Knowledge on basic and technologic topics, which will allow learning new methods and theories providing versatility to adapt themselves to new situations.
C4 – Capability to solve problems with initiative, decision-making, creativity, critic thinking and to convey and transmit knowledge and skills in engineering fields.
C6 – Capability to handle specifications, regulations and rules of mandatory compliance.
C10 – Capability to work in a multidisciplinary and multilingual environment
TEEOI3 – Knowledge of the foundation and applications of electronic circuits and microcontrollers.
As outcome of the development of the aforementioned competencies, the student will be able to solve basic implementation problems with microcontrollers including several peripherals and communications stacks where TCP/IP must be present. They will also have to introduce publicly the features of selected microcontrollers from several manufacturers.

Theoretical and Practical Contents

Cortex-M 32-bit microcontrollers
Architecture and peripherals
C programming language.
Development toolchain and libraries.
Concurrent process.
Communication protocols: CAN, LIN, TCP/IP
3th party stacks (SD, LwIP, emWin)
Operating Systems
The following demonstrations will be run
IDE and code generation
JTAG debugging
Manufacturer libraries: HAL
Microcontroller’s features:
GPIOs
Timers and Systick
Serial port
Low Power modes
Graphic library
CAN communications
TCP/IP with LwIP
SD and filesystems
Operating systems

TEACHING METHODS

Master classes will use original datasheets, manuals, user’s guides and manufacturer’s reference designs as guiding thread to introduce concepts and develop competencies. It is pursued that students have direct contact with real life documentation and development tools. The demonstrations will be coordinated with the lectures so that the students can experience the concepts given in class by writing basic implementations of the learned functionality. Demonstrations are compulsory.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	30			30					
Horas de Actividad No Presencial del Alumno/a	45			45					

Legend: M: Lecture-based | S: Seminar | GA: Applied classroom-based groups | GL: Applied laboratory-based groups | GO: Applied computer-based groups | GCL: Applied clinical-based groups | TA: Workshop | TI: Industrial workshop | GCA: Applied fieldwork groups

Evaluation methods

- End-of-course evaluation

Evaluation tools and percentages of final mark

- Exercises, cases or problem sets 10%
- Individual assignments 90%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

10 % of the evaluation will be function of the achievements attained in the demonstrations. The final assessment work will be presented to the professor who will evaluate the specifications fulfillment (50 %), the right use of the explained methodologies (25 %), the grade of self-development (10 %) and the exposition (5 %).
In order to renounce this call the student only needs not to hand in the expected work.
If the student prefers to take a final exam, it will account for 100 % of the note. To be able to opt for a final evaluation, the student should communicate that decision to the coordinator of the subject following the procedure issued by the UPV/EHU

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The same rules apply in the second call.

MANDATORY MATERIALS

32-bit microcontroller based development cards and tools (IDE, compiler, debugger).

BIBLIOGRAPHY

Basic bibliography

STM32F769NI Datasheet
32F746GDISCOVERY Kit User's Manual
STM32F7 HAL and Low - layer drivers User Manual
Developing applications on STM32Cube with LwIP TCP/IP stack User Manual
lwIP reference
CAN Specifications
Petit FAT File System Module

Detailed bibliography

AVR308 Software LIN Slave
"Embedded Software Know It All" Labrosse. Ed. Newness
"The Art Of Designing Embedded Systems" Ganssle. Ed. Newness

Journals

Web sites of interest

http://www.st.com
http://www.nongnu.org/lwip/main.html
www.semiconductors.bosch.de/pdf/can2spec.pdf
http://elm-chan.org/fsw/ff/00index_p.html
www.embedded.com

OBSERVATIONS

In the evaluation tests, only non-programmable scientific calculators are allowed to be used. If the device is programmable the calculator will be retired and no additional device will be allowed, even if it fulfills the requirements.
In case cheating is detected, the protocol about academic ethic issued by the University of the Basque Country will be followed.

Universidad del País Vasco — Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty 163 - Faculty of Engineering - Vitoria-Gasteiz **Cycle** .

Degree GIEIAU10 - Bachelor's Degree in Industrial Electronics and Automation Engine **Year** Fourth year

COURSE

26006 - Extended Industrial Information Technology **Credits, ECTS:** 6

COURSE DESCRIPTION

The 4th year optional subject ‘Extension of Industrial Computing’ is a subject that can be taken from two degrees:
-Degree in Computer Engineering in Management and Information Systems
-Degree in Industrial Electronics and Automation Engineering.

Therefore, it is assumed that the students' skills and knowledge at the beginning of the course are very different.

In any case, it is advisable to have programming knowledge, either in PC platforms or other more specific ones.

Given its terminal nature, the aim is to offer a practical vision that is as up-to-date as possible in accordance with the latest trends in the sector, without losing rigour in the treatment of the contents.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

- TEEOI10 - Applied knowledge of industrial computing and communications.

The transversal competences of the module with which there is an identification on the part of the subject are:
- C10 - Ability to work in a multilingual and multidisciplinary environment.
- C13 - Apply the strategies of the scientific methodology: analyze the situation and problems qualitatively and quantitatively. Raise hypotheses and solutions using engineering models.

In addition to those mentioned:
- The student is able to write reports at the level corresponding to the course
- Capacity for innovation and creativity
- Autonomous Learning

Theoretical and Practical Contents

T1. Introduction to Industry 4.0
T2. Infrastructure
T3. Applications
T4. Artificial Intelligence
T5. High-level elements

TEACHING METHODS

The teaching methodology is based on cooperative learning, using mainly group work and autonomous learning.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	30			30					
Horas de Actividad No Presencial del Alumno/a	45			45					

Legend:
M: Lecture-based — S: Seminar — GA: Applied classroom-based groups
GL: Applied laboratory-based groups — GO: Applied computer-based groups — GCL: Applied clinical-based groups
TA: Workshop — TI: Industrial workshop — GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 20%
- Exercises, cases or problem sets 40%
- Teamwork assignments (problem solving, Project design) 40%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Own Theoretical Work: 40% -Practical Work: 40%.
-Practical work: 40%.

Tests on other theoretical and/or practical work: 20% -Tests on other theoretical and/or practical work: 20%.
-Modification according to oral presentation: up to +-10%.
Modification according to cross-evaluations within the working groups: up to +-10% -Modification according to cross-evaluations within the working groups: up to +-10%.

According to the Regulations governing student assessment in official undergraduate degrees, chapter II, article 8, section 3, all students will have the right to be assessed by the final assessment system, regardless of whether or not they have participated in the continuous assessment system. To do so, students must submit a written waiver of continuous assessment to the lecturer responsible for the subject, for which they will have a period of 9 weeks from the beginning of the term, in accordance with the academic calendar of the centre.

If a student wishes to waive the exams, he/she may do so by writing to the subject's teaching staff before the start date of the exams or by not taking the final exam, if there is one.

If there is a written final exam, a minimum grade of 4/10 must be obtained in order to pass the course.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

According to the Regulations governing student assessment in official undergraduate degrees, Chapter II, Article 9, section 2, this type of assessment will be carried out exclusively through the final assessment system. Likewise, according to section 3 of the aforementioned article, this test may consist of as many examinations and assessment activities as necessary.

If appropriate, the results obtained in the continuous assessment part of the Ordinary Examination may be maintained.

‘In the event that it is not possible to carry out a face-to-face assessment of the subject, for reasons associated with the health situation, the assessment will be adapted to the current situation’.

MANDATORY MATERIALS

Given the high technological component of the subject and the great dynamism of these technologies, the teaching team of the subject will indicate at the beginning of the course the compulsory material to be used in the course (if any).

BIBLIOGRAPHY

Basic bibliography

Due to the great dynamism of the contents of the subject, there is no basic material established for it. At the beginning of the course, students will be offered a set of updated bibliographical references.

Detailed bibliography

Due to the great dynamism of the contents of the subject, there is no established in-depth material on the subject. At the beginning of the course, students will be offered a set of updated bibliographical references.

Journals

Due to the great dynamism of the contents of the subject, there is no established set of reference journals for the subject. At the beginning of the course, students will be offered an updated set of journals.

Web sites of interest

Due to the great dynamism of the contents of the subject, there is no established set of Internet addresses for the subject. At the beginning of the course, students will be provided with an updated set of bibliographical references.

OBSERVATIONS

Universidad del País Vasco — Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty 163 - Faculty of Engineering - Vitoria-Gasteiz **Cycle** .

Degree GMECAN10 - Bachelor`s Degree in Mechanical Engineering **Year** Fourth year

COURSE

25988 - Environmental Technologies **Credits, ECTS:** 6

COURSE DESCRIPTION

The objective of the course "Environmental Technologies" is to acquire the basic concepts of environmental pollution and solutions to pollution in the biosphere in the three main natural resources, that are, air, water and soil. This subject shall permit a sufficient knowledge to develop your professional activity in the Engineering field in various sectors of industry.

The subject has no prerequisites. However, due to its characteristics, it is convenient that the matriculated students have already coursed "Chemical Basics of Engineering" imparted in the first course.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

SPECIFIC SKILLS
S.S.1. Know the concepts of environmental pollution and sustainability..
S.S.2. Identify, state and understand the global problems of water, air and waste, as well as their influence on the environment.
S.S.3. Applications of environmental pollution concepts and prevention and control technologies to air, water, and soil pollution problems as well as to environmental quality.
S.S.4. Ability to solve problems in the industrial technology field with initiative, decisión-making, creativity, using critical reasoning and being able to communicate and transmit the knowledge, skills and abilities acquired.
S.S.5. Know and understand how to apply the legislation related to the environment.
S.S.6. Analyze and anticipate the most important risks associated with the chemical industry (and related industries).
TRANSVERSAL SKILLS
T.S.1. Work in multidisciplinary environments.
T.S.2. Ability to collect, understand and interpret information related to environmental technologies in a scientific and technical mode and using appropriately the main bibliographic sources.
T.S.3. Responsible and orderly attitude at work and predisposition to learning.

Theoretical and Practical Contents

TOPIC 1. INTRODUCTION: THE ENVIRONMENT AND POLLUTION
TOPIC 2. ATMOSPHERIC POLLUTION (AIR)
2.1. Atmosphere. Composition and structure
2.2. Energy balance of the atmosphere
2.3. Air pollution process
2.4. Air pollutants
2.5. Air quality
2.6. Effects of air pollution
2.7. Techniques for reducing and controlling air industrial emissions
TOPIC 3. WATER POLLUTION
3.1. Nature and properties of water
3.2. Origin of water contamination
3.3. Water pollutants and effects
3.4. Surface water quality
3.5. Water and wastewater treatments.
TOPIC 4. SOIL POLLUTION AND URBAN WASTE
4.1. Soil properties and pollutants
4.2. Waste
4.3. Soil decontamination techniques

TEACHING METHODS

The methodology proposed for this subject is an active methodology that implies that the scheduled activities allow students to participate in the construction of their knowledge and acquire more responsibility.
The communication and relationship between teachers and students is carried out through the following ways:
· Lectures and classroom practices.
· Use of eGela. In this platform the students have at their disposal all the necessary information and the news are posted in eGela. Throughout the course and depending on the proposed work, forums will be opened for the exchange of information.
· Tutorials

Except for the tests and the written examination, the activities developed by the students are part of the cooperative work, in which the students work in groups.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	45		15						
Horas de Actividad No Presencial del Alumno/a	67,5		22,5						

Legend:
M: Lecture-based
S: Seminar
GA: Applied classroom-based groups
GL: Applied laboratory-based groups
GO: Applied computer-based groups
GCL: Applied clinical-based groups
TA: Workshop
TI: Industrial workshop
GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 70%
- Multiple choice test 15%
- Teamwork assignments (problem solving, Project design) 15%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

MIXED EVALUATION

The evaluation will consist of the following activities:

a) Written examination (70 % of the final mark)
b) Multiple choice tests (15 % of the final mark)
c) Group Works (15 % of the final mark)

The final mark is obtained by applying these percentages to the results of the evaluation in each of the concepts indicated above, taking into account the following REQUIREMENTS:

i) Carry out all the established activities within the set deadline.
ii) Obtain a minimum score of 3.5/10 in each of the global evaluation activities.
iii) A final mark of 5.0/10.

Whether any requirement is not met, the subject will be suspended in the ordinary examination with a final mark of 4.0, regardless the results obtained in the activities.

EVALUATION INSTRUMENTS

The evaluation instrument for each activity is a rubric or evaluation matrix, which will detail the criteria and indicators used to evaluate the achievement of the competencies. All evaluation instruments are published in eGela.

The multiple-choice tests, which will be performed via eGela or in class, positive answers will add 1 point and negative answers will reduce 0.25 points. Group work will be evaluated by the teacher by means of a rubric.

FINAL EVALUATION

Students who do not opt for the MIXED evaluation system described above will take a final exam that will include theoretical questions and problems. In order to pass the subject it will be necessary to obtain a minimum mark of 5.0/10 in this exam.

Apply for the final evaluation system:

If the student does not wish to participate in the continuous evaluation system, he/she must submit to the teacher the resignation of the continuous evaluation, for which he/she will have a period of 9 weeks, counting from the beginning of the four-month period, in accordance with the academic calendar of the center (Article 8.3 Regulations governing the evaluation of students in official undergraduate degrees, UPV/EHU). Applications will not be accepted by other ways, nor after the deadline.

RESIGNATION OF THE EVALUATION CONVOCATION

In the case of continuous evaluation, students may resign the call for assessment within a period that, at least, will be up to one month before the end of the teaching period of the subject. This resignation must be submitted in writing addressed to the teacher responsible of the subject. Resignations will not be accepted by other ways, nor after the deadline. However, in the case of a final evaluation, non-presentation of the previously established individual exams will imply the automatic resignation of the corresponding call (Article 12 Regulations governing the evaluation of students in official undergraduate degrees, UPV/EHU).

In the event that it is not possible to carry out a presential evaluation of the subject, the pertinent changes will be made for the realization of an online evaluation through the use of the existing computer tools in the UPV/EHU.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

In the extraordinary call, the evaluation process of the students is the same, being in both cases a final exam.
The final exam will consist of theoretical-questions and problems about the contents of the subject. In order to pass the subject, the minimum mark in this test will be 5/10.
The RESIGNATION procedure for the extraordinary call for evaluation of the students consists of NOT presenting to the final exam.

MANDATORY MATERIALS

Contents of the subject matter are provided by the professor through eGela.

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Orozco, C.; González, M.N.; Alfayate, J.M.; Pérez, A.; Rodríguez, F.J. "Problemas resueltos de Contaminación Ambiental". Thomson Editores Spain. Editorial Paraninfo, S.A., Madrid (2003).

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Rodríguez, J.J., Irabien, A. "Los residuos peligrosos. Caracterización, tratamientos y gestión". Editorial Síntesis, Madrid (1999).

Seoánez, M.; Angulo, I. "Manual de gestión medioambiental en la empresa. Sistemas de gestión medio ambiental, auditorías medioambientales, evaluaciones de impacto ambiental y otras estrategias". Editorial Mundi-Prensa, (1999).

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Wark, W. "Contaminación de aire. Origen y control", Editorial Limusa, México (2001).

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Williams, P.T. "Waste treatment and disposal". Editorial Wiley, Gran Bretaña (2005).

Journals

Ingeniería del Agua

Tecnología del Agua

Química Industrial

Biomass and Bioenergy

Enviromental Engineering Science

Web sites of interest

Legislación UE

http://europa.eu/pol/env/index_es.htm

Ministerio de Agricultura, Alimentación y Medio Ambiente: Prevención y Gestión de Residuos
http://www.magrama.gob.es/es/calidad-y-evaluacion-ambiental/temas/prevencion-y-gestion-residuos/default.aspx

Gobierno Vasco: Medio ambiente
http://www.ingurumena.ejgv.euskadi.net/r49-home/es

IHOBE: Sociedad pública vasca de medio ambiente
http://www.ihobe.net/

Instituto Nacional de Seguridad e higiene. Ministerio de Empleo y Seguridad Social
http://www.insht.es/portal/site/Insht/

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http://www.eea.europa.eu/publications/spatial-analysis-of-green-infrastructure

OBSERVATIONS

Universidad del País Vasco Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty 163 - Faculty of Engineering - Vitoria-Gasteiz **Cycle** .

Degree GMECAN10 - Bachelor`s Degree in Mechanical Engineering **Year** Third year

COURSE

26045 - Elasticity and Strength of Materials **Credits, ECTS:** 9

COURSE DESCRIPTION

- The elasticity and strength of materials is the science that studies the behavior of the deformable solid. Mechanics provides tools to understand the movement of bodies, and is composed of very diverse fields. One way to classify these fields is the condition of body or particle. The Physics subject of the first year studies the mechanics of the particle, considering it a point in space that has mass. When studying solids, two types are distinguished: rigid solid and deformable solid. A rigid solid will be assumed when studying velocities and accelerations since it is not necessary to study the change of shape of the body. In the second year course Applied Mechanics the rigid body is studied.
In this subject, however, it will be considered that the solids are deformable and in this case the movement has no significance. In fact, the mechanical systems studied will be in equilibrium.
The theory of elasticity studies elastic bodies, formulating mathematically the relationship between external actions and the body's response. The strength of materials, studies the most common elements of structures. These elements have a simple geometry, and allow the use of simplifying hypotheses that speed up the calculation. The results are not as accurate as those of the elasticity theory, but the error can be considered negligible.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

The behavior of real (deformable) solids is introduced in this course. After an exposition of the fundamental concepts of the Theory of Elasticity, the program focuses on the analysis and design of prismatic piece-type structural elements, subjected to different section stresses. It starts with axial stress. Next, the stresses and deformations originated both in pure bending and in simple bending are studied, and their application is carried out for the resolution of isostatic structures.
- The subject provides knowledge that is at the base of the analysis and design methods of any Mechanical Engineering work.
- Specific Technology Module Competence, Mechanics:
- Knowledge and skills to apply the fundamentals of elasticity and resistance of materials to the behavior of real solids.
- Learning outcomes:
- Know, understand and apply the fundamentals of elasticity and resistance of materials to the behavior of real solids that enable the student for the subsequent application of advanced methods and theories in their professional development in areas of mechanical engineering and also provide them with a great versatility to adapt to new situations.
- Properly apply the strategies of scientific methodology to the problems posed by structural systems and the deformable solid: analyze the situation qualitatively and quantitatively, propose hypotheses and solutions to solve problems inherent to mechanical engineering.
- Express, using the appropriate means, the theoretical knowledge, resolution methods, results and aspects inherent to the problems posed by the equilibrium of the deformable solid and structural systems, using specific vocabulary and terminology.
- Work effectively in a group integrating skills and knowledge to formulate ideas, debate proposals and make decisions in the development of own work, the elasticity and resistance of materials.
- Carry out measurements, calculations, studies, reports and other similar work related to problematic situations that may arise in the field of elasticity and resistance of materials.

Theoretical and Practical Contents

The elastic solid: stresses, deformations and compatibility equations.
- Tensionn and compression.
- Shear strength
- Flexure theory: pure, simple, compound, isostatic and hyperstatic.
- Torsion.
- Internal potential. Energy theorems

TEACHING METHODS

In the theoretical classes the theory will be explained and related examples will be solved.
Some topics will be worked on with the flipped classroom methodology, and material will be made available to the students to work on the theory at home, and doubts will be answered in class and exercises to apply the theory will be carried out.

In classroom practices, theoretical concepts can be explained and exercises to be developed proposed.

In class, the teacher will propose some work, which can be problems, practices or exercises to work on theory.
All these works will be evaluated and will account for 20% of the final grade.

During the semester, there will be a partial exam, which, if approved, will release material for the final exam.

To pass the exams, whether partial or final, you must obtain a minimum score of 3 out of 10 in each section of the same. Therefore, the final grade will be calculated as follows: 0.4 x partial exam grade + 0.4 final exam grade + 0.2 individual work grade.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	45		30	15					
Horas de Actividad No Presencial del Alumno/a	67,5		45	22,5					

Legend:
M: Lecture-based
S: Seminar
GA: Applied classroom-based groups
GL: Applied laboratory-based groups
GO: Applied computer-based groups
GCL: Applied clinical-based groups
TA: Workshop
TI: Industrial workshop
GCA: Applied fieldwork groups

Evaluation methods

- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 80%
- Individual assignments 20%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The written tests to be developed are detailed below:
A midterm exam will be held. The final exams will be attended with pending material.
The final mark of the exams will be the average of the two parts.
The deliverables to be carried out will consist of different tasks that will be described throughout the course, including the laboratory practices. Some should be done individually, others in groups. Some of them will be face-to-face and will take place in class.
In the event that presential evaluation of the subject cannot be carried out, the pertinent changes will be made to carry out an on-line evaluation by using the IT tools available at the UPV / EHU. The characteristics of this online assessment will be published in the student guides and in eGela

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

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MANDATORY MATERIALS

Teachers notes.
Material available in egela

BIBLIOGRAPHY

Basic bibliography

Joseba García Melero. Resistencia de Materiales. Editorial: UPV-EHU

Detailed bibliography

Manuel Vazquez. Resistencia de Materiales. Editorial: Universidad Politécnica de Madrid
Luis Ortiz Berrocal. Resistencia de Materiales. Editorial Mc Graw Hill
Timoshenko. Resistencia de Materiales (2 tomos). Editorial: Espasa-Calpe

Journals

Web sites of interest

http://egela.ehu.eus

OBSERVATIONS

Universidad del País Vasco Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty 163 - Faculty of Engineering - Vitoria-Gasteiz **Cycle** .

Degree GMECAN10 - Bachelor`s Degree in Mechanical Engineering **Year** Third year

COURSE

26048 - Industrial Structures and Buildings **Credits, ECTS:** 9

COURSE DESCRIPTION

DESCRIPTION:
The subject can be considered as a continuation of Elasticity and Resistance of Materials, studied in the previous semester. There students are introduced to the study of diverse techniques for the analysis of structures, that is, of methods that allow to determine the state of strains, stresses and deformations in the diverse components of a structure under outside actions.
In particular the subject is centered in the study of such components following the regulations in force. To achieve this aim in the first introductory chapter the student is familiarized with the corresponding regulatory documents. Afterwards metallic structures are studied, reviewing certain concepts such as structural design, structural security, limit states, structures with tie bar joints, structures with rigid joints, actions to take into account in building, calculating and dimensioning of metallic elements. Later on reinforced concrete parts are studied, explaining also the regulations in force in this case, and then concepts such as materials forming the concrete, durability, properties, calculi basis of the reinforced concrete and dimensioning of parts made of this material are analyzed.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

COMPETENCES:
TEM1: Knowledge and ability to apply techniques from graphic engineering (SC)
TEM4: Knowledge and ability to apply the basis of the elasticity and resistance of materials to real solids behavior (SC)
TEM5: Knowledge and ability to calculate and design industrial structures and constructions (SC)
C4: Capacity to solve problems with initiative, making decisions, creativity, and critic reasoning, and to comunicate and transmit knowledge, abilities, and skills in the field of engineering (SC)
C7: Capacity to analyze and asses the social and environmental impact of the tehcnical solutions (CT)
C10: Capacity to work in a multilingual and multidisciplinary environment (CT)
FB9: Work efficiently in teams integrating capacities and knowledge to make decisions in the field of engineering (CT)
FB10: Adopt a responsible attitude, organized in work and ready for learning, developing resources for autonomous work (CT)

*SC: Specific Competence; TC: Transversal Competence

LEARNING RESULTS:
-Know, understand and apply the theoretical and technological concepts required to identify and suggest structural systems, concepts which provide to the student with the necessary training to fulfill the regulatory requisites and the required functionality.
-Apply the proper strategies of the scientific methodology: analyze the problematic situation qualitatively and quantitatively; suggest hypothesis and solutions to solve structural problems of different complexity.
-Communicate in a proper way the knowledge, procedures, results, skills and aspects related to the structural design, making use of the specific vocabulary and terminology, and the suitable means.
-Work efficiently in multidisciplinary and multilingual environments integrating skills and knowledge to adopt decisions related to the design and management of structural projects in industry.
-Develop designs and projects in the field of industrial constructions according to the corresponding constructive technology and making use of the available techniques and tools to solve structural problems.
-Know, understand and apply the legislation, specifications, regulations and norms of binding compliance in the industrial construction field.

Theoretical and Practical Contents

PRESENTATION CHAPTER: Regulations in metallic structures
CHAPTER 1: Introduction to structural design
CHAPTER 2: Structures with tie bar joints
CHAPTER 3: Structures with rigid joints
CHAPTER 4: Actions in the building
CHAPTER 5: Characterization of industrial units
CHAPTER 6: Introduction to the reinforced concrete
CHAPTER 7: Calculation basis of reinforced concrete
CHAPTER 8: Dimensioning of sections of reinforced concrete
CHAPTER 9: Matrix calculus of structures
CHAPTER 10: Sustainable construction

TEACHING METHODS

During the course some applied exercises will be done and some other proposed exercises will be collected, similar to those done in the lectures. In the end of the semester a final written exercise will be held.
Parallel to this, some practices will be developed with the assistance of a computer to design and calculate industrial pavilions.

SCHEDULE:
WEEK 5 – COLLECT PROPOSED EXERCISES ON TRUSSES (development of competences TEM4, TEM5, FB10)
WEEK 7 – COLLECT PROPOSED EXERCISES ON PURLINS (development of competences TEM4, TEM5, FB9, FB10)
WEEK 10 – COLLECT PROPOSED EXERCISES ON BEAMS (development of competences TEM4, TEM5, FB10)
WEEK 12 - COLLECT PROPOSED EXERCISES ON PIERS (development of competences TEM4, TEM5, FB10)
WEEK 13 - COLLECT EXERCISES ON SUSTAINABILITY (development of competences C4, C7, C10, FB9)
WEEK 15 - COLLECT PROPOSED EXERCISES ON FOOTINGS (development of competences TEM4, TEM5, FB10)
from WEEK 1 to WEEK 4 – EXPLANATION OF CYPE PROGRAM (development of competences TEM1, TEM4, TEM5, FB10)
from WEEK 5 to WEEK 15 – DEVELOP CYPE PRACTICE (development of competences TEM1, TEM4, TEM5, C4, C10, FB9)
WEEK 15 - COLLECT REPORT OF LABORATORY PRACTICES (development of competences TEM4, TEM5)

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	45		30		15				
Horas de Actividad No Presencial del Alumno/a	67,5		45		22,5				

Legend:
M: Lecture-based
S: Seminar
GA: Applied classroom-based groups
GL: Applied laboratory-based groups
GO: Applied computer-based groups
GCL: Applied clinical-based groups
TA: Workshop
TI: Industrial workshop
GCA: Applied fieldwork groups

Evaluation methods

- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 60%
- Exercises, cases or problem sets 5%
- Individual assignments 5%
- Teamwork assignments (problem solving, Project design) 20%
- Oral presentation of assigned tasks, Reading¿ 10%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

TO GIVE UP THE CONTINUOUS ASSESSMENT CALL:
Due to the fact that our final exam weights a 60% of the total mark of the subject all students, following the continuous assessment or final evaluation, will give up the evaluation call by simply not coming to the final exam.
Additionally, students can present their giving up of the continuous assessment officially by following the procedure described in the regulation, up to the ninth week from the begining of the semester, and in the period indicated by the regulation on docent-planning and evaluation of the Teaching/Learning. Also, it will be communicated to the docent responsible of the subject. The regulation can be found in the following link:
http://www.ehu.eus/es/web/estudiosdegrado-gradukoikasketak/ebaluaziorako-arautegia

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

THE SAME AS IN ORDINARY CALL.

MANDATORY MATERIALS

The notes for the lectures.
The Technical Building Code.
Tables of rolled profiles (Arcelor).

BIBLIOGRAPHY

Basic bibliography

1. Royal Decree 2267/2004, of the 3rd of December, by which the Regulation of security against fire in industrial establishments is approved
2. Law 38/1999 of the 5th of November: Ordinance of building
3. Royal Decree 314/2006, of the 17th of March, by which the Technical Code of Building is approved
4. Technical Code of Building or (Código Técnico de Edificación - CTE)
5. Eurocode 3: Design of Steel Structures
6. EHE 08 instruction
7. Eurocode 2: Design of Concrete Structures
8. Notes for the lectures of "Estructuras metálicas y mixtas", volumes 3 and 4 (version 2006), Pedro Jose Landa Lazcano, Professor of the School of Engineering of Bilbao
9. Notes for the lectures of "Estructuras y Construcciones Industriales", (2014), Vanessa Garcia Marina, Lecturer of the University School of Engineering of Vitoria-Gasteiz
10. Catalogues of Arcelor (Aceralia)
11. The bibliography exposed on the notes for the lectures.
12. Código Estructural

Detailed bibliography

Journals

Web sites of interest

https://egela.ehu.es/

OBSERVATIONS

PREREQUISITES:
Although there are not official prerequisites, it is highly recommendable that the student has passed or at least studied the subject of "Elasticity and Resistance of Materials".

In the event that it is not possible to carry out a face-to-face evaluation of the subject, the pertinent changes will be made to carry out an on-line evaluation using the existing computer tools at the UPV/EHU. The characteristics of this on-line evaluation will be published in the student guides (annex or action plan) and in eGela.

Universidad del País Vasco — Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty 163 - Faculty of Engineering - Vitoria-Gasteiz **Cycle** .

Degree GMECAN10 - Bachelor`s Degree in Mechanical Engineering **Year** Third year

COURSE

26049 - Machine Design **Credits, ECTS:** 9

COURSE DESCRIPTION

The subject Machine Design is studied in the sixth semester of the Degree in Mechanical Engineering, is a four months subject. Is complemented with the subject Kinematics and Dynamics of Machines, in the fifth semester. For tracking the course are necessary basic knowledge of mechanics acquired in the subject Applied Mechanics in the second year and resistance of materials acquired in the subject Elasticity and Strength of Materials in the fifth semester.
Knowledge of machine elements will be of great interest for the optional subject Computer Aided Structural Analysis and for the realization of the end of Degree Project.
The subject Machine Design is for the graduate in Mechanical Engineering, an introduction to the world of industrial machinery and is an important tool for the development of labor activity related to the machinery and its operation, both in design activities, construction base, maintenance or marketing.
In the first part the basic principles are studied in the engineering design of machines, study of stresses and fault conditions considerating static and dynamic loads, and the study of different criteria for predicting failure in a part, known loads that it will bear.
In the second part, the description and calculation of machine elements is faced. Different mechanical elements commonly found on machines are studied: Support elements in shafts such as bearings, power transmission elements such as gears, belts or chains, coupling elements such as feather keys. Guidelines for the design are discussed, considering different aspects such as strength, durability, manufacturing and assembly.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

Know, understand and apply the fundamentals of Machine Design, so that enable students for the subsequent application of advanced methods and theories, in their professional development in areas of the Engineering Mechanics and likewise will provide themselves with great versatility for adapt to new situations.
Apply properly the strategies of scientific methodology: analyze qualitative and quantitative problem situations; hypothesizing and solutions for solving problems of Machine Design in the field of mechanical engineering. Understand and interpret the results.
Express correctly, using appropriate means, theoretical knowledge, solving methods, results and aspects inherent to the problems posed by the calculation, construction and testing of machines, in mechanical engineering, using the specific vocabulary and terminology of the subject.
Work in groups effectively integrating skills and knowledge to formulate ideas, discuss proposals and decisions on the development of their own works of Machine Design and in the field of mechanical engineering.
Develop designs, projects and processes in the field of Machine Design, and within the field of mechanical engineering. And also make measurements, calculations, studies, reports and other similar work-related problem situations that may arise in the field of specialty.
Know, understand, interpret and apply correctly, the laws, specifications, regulations and mandatory standards in Machine Design, within the field of mechanical engineering.

Theoretical and Practical Contents

Chapter 0.- Overview on design and mechanical analysis.
- 0.1.- oPlanning and rganization of the course
- 0.2.- Program of the course.
- 0.3.- Current status of the analysis and design of machines.
- 0.4.- Relationship with other subjects.
- 0.5.- Codes and standards.
- 0.6.- Units.

Chapter 1.- Introduction to machine design.
- 1.1.- Design criteria.
- 1.2.- Design and analysis of machines: rough calculations, FEM, prototypes.
- 1.3.- Selection of materials: qualitative and quantitative properties.
- 1.4.- Safety factor in machine design.

Chapter 2.- Static stress calculations.
- 2.1.- Local effects: stress concentration.
- 2.2.- Static failure theories machine design.
- 2.3.- Factors that promote brittle failure in ductile materials.
- 2.4.- Introduction to fracture mechanics.

Chapter 3.- Fatigue of materials in mechanical design.
- 3.1.- Fatigue tests; Fatigue limit.

3.2.- Factor that modify the fatigue limit.
3.3.- Concentration of stresses in fatigue.
3.4.- Effect of the non-zero mean stresses.
3.5.- Cumulative damage; Palmgren-Miner method.
3.6.- Fatigue analysis with multiaxial stresses.
Chapter 4.- Introduction to Finite Elements Method (FEM).
4.1.- Brief historical overview.
4.2.- Intuitive basis.
4.3.- Field of application.
4.4.- Properties of the elements.
4.5.- Organization of a Finite Element program: preprocessor, processor and postprocessor.
Chapter 5.- Design of shafts and associated parts.
5.1.- Introduction.
5.2.- Dimensioning of shafts: static and fatigue.
5.3.- Design of other elements associated to shafts: couplings, keys, bolts and pins.
5.4.- Some aspects to consider when designing axes.
5.5.- Redesign of crankshafts.
Chapter 6.- Calculation of gears.
6.1.- General information on gear design.
6.2.- Calculation Module: Lewis formula.
6.3.- Checking module to resistance.
6.4.- Checking module to wear.
Chapter 7.- Belt drives.
7.1.- Introduction y classification.
7.2.- Behavioral model of belts.
7.3.- Design belt drives.
Chapter 8.- Clutchs, brakes and screws.
8.1.- Function and types of clutches.
8.2.- Friction clutches.
8.3.- Approach to the problem of braking.
8.4.- Brake calculation: tape and disk shoe.
8.5.- Screws for power transmission; ballscrews.
Chapter 9.- Bearings.
9.1.- Different types. Nomenclature. Characteristic elements.
9.2.- Static load and dynamic. Equivalent load.
9.3.- Durability of bearings.
9.4.- Choosing bearings. Using catalogs.
9.5.- Bearings with Hydrodynamic and hydrostatic lubrication.
Chapter 10.- Experimental methods in machine design.
10.1.- Types of tests.
10.2.- Measuring instrumentation.
10.3.- Tests with static and fatigue loads.
10.4.- Vibratory tests: natural frequencies, damping and vibration modes.
10.5.- Monitoring and diagnostics of machines.

TEACHING METHODS

In the lectures the theory is explained and related examples are solved. In the classroom practices can be explained theoretical concepts and provide exercises to develop.
A work will be proposed for each group. The focus will be on any of the items corresponding to points 7 to 10.
Groups should define the conditions of influence and demands to be achieved.
Should be known:
- The machine / device mounting location.
- Terms of Service. Requirements.
- Commercial data.

Depending on the element or elements chosen for the design, should be investigated:
- Loads, types and magnitudes.
- Speeds, transmission ratio.
- Mounting room.
- Ambiental conditions.
- Rigidity of the adjacent parts.
- Life.
- Precission.
- Noise.
- Friction and service temperature.

- Lubricationn y manteinance.
- Mounting and dismounting.
- Power to transmit.

Results should be exposed at class.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	45		30	15					
Horas de Actividad No Presencial del Alumno/a	67,5		45	22,5					

Legend:

M: Lecture-based | S: Seminar | GA: Applied classroom-based groups
GL: Applied laboratory-based groups | GO: Applied computer-based groups | GCL: Applied clinical-based groups
TA: Workshop | TI: Industrial workshop | GCA: Applied fieldwork groups

Evaluation methods

- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 60%
- Exercises, cases or problem sets 10%
- Teamwork assignments (problem solving, Project design) 30%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The written test to develop will have a value of 60%.
Elaboration of a written test based on theoretical and practical knowledge which are assessed to the level of analysis.
And as stated in the management regulations for degree courses in Article 39. Training program and teaching guides: Regardless the assessment method, if performing a final test involving at least 50% of the total mark of the subject is contemplated, not to run this test constitute a waiver of the notice of assessment and must recorded as a not examined.
The group work has a value of 30% of the final grade will be taken into account for the evaluation of the work:
- The document: Its quality and the skills developed in the group work (minutes, tutoring, contact hours).
- Presentation: Evaluation of fellows, teacher assessment, attendance and participation.

To pass the subject is necessary to pass independently both the examination and group work. If pass one of the two parts (examination or work) in May session, note that part will be saved until the July session. Failure to pass the written test will be the final mark of the examination, regardless of the job.
Practical work 10%
Delivery of reports made in group practices, evaluating the quality of reporting.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Same than in the ordinary examination.

MANDATORY MATERIALS

Teacher notes. Theory, problems, tables and graphs (E-gela).

BIBLIOGRAPHY

Basic bibliography

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Robert. L. Norton. "Diseño de Maquinaria".
Robert L. Mott "Diseño de Elementos de Máquinas".
Carlos Angulo, Luis Norberto López de Lacalle, Josu Agirrebeitia, Charles Pinto. "Elementos de Máquinas".
R. Avilés. "Análisis de Fatiga en Máquinas".
R. Avilés. "El método de los elementos finitos en Ingeniería Mecánica".
M.F. Spotts. "Proyecto de elementos de máquinas".

Detailed bibliography

NORTON: "Diseño de máquinas"
LUIS GARCIA PASCUAL: "Teoría de máquinas".
MOTT.:"Diseño de elementos de máquinas"
G.NIEMANN.:"Elementos de máquinas".

Journals

Electronic Journals for Mechanical Engineering.- Mechanical Engineering Education.- Journal of Mechanical Design.-

Journal of Mechanical Engineering Science.

Web sites of interest

http://moodle.ehu.es http://www.aenor.es/
http://www.skf.com/
http://www.geartechnology.com/
http://www.indarbelt.es/
http://www.infomecanica.com/
http://www.cadersa.es/

OBSERVATIONS

PREREQUISITES:
Although there are not official prerequisites, it is highly recommendable that the student has passed or at least studied the subject of "Elasticity and Resistance of Materials".

In the event that it is not possible to carry out a face-to-face evaluation of the subject, the pertinent changes will be made to carry out an on-line evaluation using the existing computer tools at the UPV/EHU. The characteristics of this on-line evaluation will be published in the student guides (annex or action plan) and in eGela.

Universidad del País Vasco — Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty 163 - Faculty of Engineering - Vitoria-Gasteiz **Cycle** .

Degree GQUIIN10 - Bachelor's Degree in Industrial Chemical Engineering **Year** Fourth year

COURSE

25988 - Environmental Technologies **Credits, ECTS:** 6

COURSE DESCRIPTION

The objective of the course "Environmental Technologies" is to acquire the basic concepts of environmental pollution and solutions to pollution in the biosphere in the three main natural resources, that are, air, water and soil. This subject shall permit a sufficient knowledge to develop your professional activity in the Engineering field in various sectors of industry.

The subject has no prerequisites. However, due to its characteristics, it is convenient that the matriculated students have already coursed "Chemical Basics of Engineering" imparted in the first course.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

SPECIFIC SKILLS
S.S.1. Know the concepts of environmental pollution and sustainability..
S.S.2. Identify, state and understand the global problems of water, air and waste, as well as their influence on the environment.
S.S.3. Applications of environmental pollution concepts and prevention and control technologies to air, water, and soil pollution problems as well as to environmental quality.
S.S.4. Ability to solve problems in the industrial technology field with initiative, decisión-making, creativity, using critical reasoning and being able to communicate and transmit the knowledge, skills and abilities acquired.
S.S.5. Know and understand how to apply the legislation related to the environment.
S.S.6. Analyze and anticipate the most important risks associated with the chemical industry (and related industries).
TRANSVERSAL SKILLS
T.S.1. Work in multidisciplinary environments.
T.S.2. Ability to collect, understand and interpret information related to environmental technologies in a scientific and technical mode and using appropriately the main bibliographic sources.
T.S.3. Responsible and orderly attitude at work and predisposition to learning.

Theoretical and Practical Contents

TOPIC 1. INTRODUCTION: THE ENVIRONMENT AND POLLUTION
TOPIC 2. ATMOSPHERIC POLLUTION (AIR)
2.1. Atmosphere. Composition and structure
2.2. Energy balance of the atmosphere
2.3. Air pollution process
2.4. Air pollutants
2.5. Air quality
2.6. Effects of air pollution
2.7. Techniques for reducing and controlling air industrial emissions
TOPIC 3. WATER POLLUTION
3.1. Nature and properties of water
3.2. Origin of water contamination
3.3. Water pollutants and effects
3.4. Surface water quality
3.5. Water and wastewater treatments.
TOPIC 4. SOIL POLLUTION AND URBAN WASTE
4.1. Soil properties and pollutants
4.2. Waste
4.3. Soil decontamination techniques

TEACHING METHODS

The methodology proposed for this subject is an active methodology that implies that the scheduled activities allow students to participate in the construction of their knowledge and acquire more responsibility.
The communication and relationship between teachers and students is carried out through the following ways:
· Lectures and classroom practices.
· Use of eGela. In this platform the students have at their disposal all the necessary information and the news are posted in eGela. Throughout the course and depending on the proposed work, forums will be opened for the exchange of information.
· Tutorials

Except for the tests and the written examination, the activities developed by the students are part of the cooperative work, in which the students work in groups.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	45		15						
Horas de Actividad No Presencial del Alumno/a	67,5		22,5						

Legend:
M: Lecture-based
S: Seminar
GA: Applied classroom-based groups
GL: Applied laboratory-based groups
GO: Applied computer-based groups
GCL: Applied clinical-based groups
TA: Workshop
TI: Industrial workshop
GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 70%
- Multiple choice test 15%
- Teamwork assignments (problem solving, Project design) 15%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

MIXED EVALUATION

The evaluation will consist of the following activities:

a) Written examination (70 % of the final mark)
b) Multiple choice tests (15 % of the final mark)
c) Group Works (15 % of the final mark)

The final mark is obtained by applying these percentages to the results of the evaluation in each of the concepts indicated above, taking into account the following REQUIREMENTS:

i) Carry out all the established activities within the set deadline.
ii) Obtain a minimum score of 3.5/10 in each of the global evaluation activities.
iii) A final mark of 5.0/10.

Whether any requirement is not met, the subject will be suspended in the ordinary examination with a final mark of 4.0, regardless the results obtained in the activities.

EVALUATION INSTRUMENTS

The evaluation instrument for each activity is a rubric or evaluation matrix, which will detail the criteria and indicators used to evaluate the achievement of the competencies. All evaluation instruments are published in eGela.

The multiple-choice tests, which will be performed via eGela or in class, positive answers will add 1 point and negative answers will reduce 0.25 points. Group work will be evaluated by the teacher by means of a rubric.

FINAL EVALUATION

Students who do not opt for the MIXED evaluation system described above will take a final exam that will include theoretical questions and problems. In order to pass the subject it will be necessary to obtain a minimum mark of 5.0/10 in this exam.

Apply for the final evaluation system:

If the student does not wish to participate in the continuous evaluation system, he/she must submit to the teacher the resignation of the continuous evaluation, for which he/she will have a period of 9 weeks, counting from the beginning of the four-month period, in accordance with the academic calendar of the center (Article 8.3 Regulations governing the evaluation of students in official undergraduate degrees, UPV/EHU). Applications will not be accepted by other ways, nor after the deadline.

RESIGNATION OF THE EVALUATION CONVOCATION

In the case of continuous evaluation, students may resign the call for assessment within a period that, at least, will be up to one month before the end of the teaching period of the subject. This resignation must be submitted in writing addressed to the teacher responsible of the subject. Resignations will not be accepted by other ways, nor after the deadline. However, in the case of a final evaluation, non-presentation of the previously established individual exams will imply the automatic resignation of the corresponding call (Article 12 Regulations governing the evaluation of students in official undergraduate degrees, UPV/EHU).

In the event that it is not possible to carry out a presential evaluation of the subject, the pertinent changes will be made for the realization of an online evaluation through the use of the existing computer tools in the UPV/EHU.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

In the extraordinary call, the evaluation process of the students is the same, being in both cases a final exam.
The final exam will consist of theoretical-questions and problems about the contents of the subject. In order to pass the subject, the minimum mark in this test will be 5/10.
The RESIGNATION procedure for the extraordinary call for evaluation of the students consists of NOT presenting to the final exam.

MANDATORY MATERIALS

Contents of the subject matter are provided by the professor through eGela.

BIBLIOGRAPHY

Basic bibliography

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Bueno, J.L., Sastre, H., Lavín, A.G. "Contaminación e ingeniería ambiental. Vol. I. Conceptos generales y actividades contaminantes", Ficyt, Oviedo (1997).

Bueno, J.L., Sastre, H., Lavín, A.G. "Contaminación e ingeniería ambiental. Vol. II. Contaminación atmosférica", Ficyt, Oviedo (1997).

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Bueno, J.L., Sastre, H., Lavín, A.G. "Contaminación e ingeniería ambiental. Vol. IV. Degradación del suelo y tratamiento de residuos", Ficyt, Oviedo (1997).

Bueno, J.L., Sastre, H., Lavín, A.G. "Contaminación e ingeniería ambiental. Vol. V. Gestión de la contaminación", Ficyt, Oviedo (1997).

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De Lora, F.; Miro, J. "Técnicas de defensa del medio ambiente". Vol. I. Labor, S.A., Barcelona (1978).

De Nevers, N. "Ingeniería de control de la contaminación del aire", Editorial McGraw-Hill Interamericana Editores, México (1998).

Díaz, M. "Ecuaciones y cálculos para el tratamiento de aguas". Editorial Paraninfo, Madrid (2018).
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Hernández, A. "Depuración y desinfección de aguas residuales". Colección senior nº 9. Thomson Learning. Editorial Paraninfo, Madrid (2001).

Hontoria, E., Zamorano, M. "Fundamentos del manejo de los residuos urbanos". Editorial Canales y Puertos Colegio de Ingenieros de Caminos, Madrid (2001).

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Lagrega, M.D., Buckingham, Ph. L., Evans, J.C. "Gestión de residuos tóxicos. Tratamientos, eliminación y recuperación de suelos". Editorial Mc Graw Hill, Madrid (1996).

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Ramalho, R.S. "Tratamiento de aguas residuales", Editorial Reverté, Barcelona (1996).

Rodríguez, J.J., Irabien, A. "Los residuos peligrosos. Caracterización, tratamientos y gestión". Editorial Síntesis, Madrid (1999).

Seoánez, M.; Angulo, I. "Manual de gestión medioambiental en la empresa. Sistemas de gestión medio ambiental, auditorías medioambientales, evaluaciones de impacto ambiental y otras estrategias". Editorial Mundi-Prensa, (1999).

Spiro, T.G., Stigliani, W.M. "Química medioambiental", Editorial Pearson Educación, Madrid (2004).

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Williams, P.T. "Waste treatment and disposal". Editorial Wiley, Gran Bretaña (2005).

Journals

Ingeniería del Agua

Tecnología del Agua

Química Industrial

Biomass and Bioenergy

Enviromental Engineering Science

Web sites of interest

Legislación UE

http://europa.eu/pol/env/index_es.htm

Ministerio de Agricultura, Alimentación y Medio Ambiente: Prevención y Gestión de Residuos
http://www.magrama.gob.es/es/calidad-y-evaluacion-ambiental/temas/prevencion-y-gestion-residuos/default.aspx

Gobierno Vasco: Medio ambiente
http://www.ingurumena.ejgv.euskadi.net/r49-home/es

IHOBE: Sociedad pública vasca de medio ambiente
http://www.ihobe.net/

Instituto Nacional de Seguridad e higiene. Ministerio de Empleo y Seguridad Social
http://www.insht.es/portal/site/Insht/

European Environment Agency EEA. Spatial analysis of green infrastructure in Europea
http://www.eea.europa.eu/publications/spatial-analysis-of-green-infrastructure

OBSERVATIONS

Universidad del País Vasco Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty 163 - Faculty of Engineering - Vitoria-Gasteiz **Cycle** .

Degree GQUIIN10 - Bachelor's Degree in Industrial Chemical Engineering **Year** Third year

COURSE

26091 - Industrial Chemistry **Credits, ECTS:** 6

COURSE DESCRIPTION

ENGLISH VERSION

STUDENT GUIDE
SUBJECT: INDUSTRIAL CHEMISTRY
UPV/ EHU subject code: 26091
ASSOCIATED PROFESSOR Dr.JOSE MARIA LOMAS

This subject deals with the production of the main chemical products. They are considered from their origin in raw materials, studying their valuation through operations and processes.
This subject is transversal, in that it applies the knowledge acquired in characteristic subjects of Chemical Engineering.

CONTEXT.

This subject deals with the large-scale production of the main chemicals. The transformation of raw materials is considered from their origin, until transforming them into products, through the corresponding operations and processes.
This subject is transversal, insofar as it applies the knowledge of other fields of Physics and Chemistry, especially Thermodynamics, Q. Inorganic, Q. Organic and Q. Physics, in addition to the field of Engineering, such as Fluid Mechanics and Process Control .
In this sense, this subject collects elements of various subjects studied in the career, giving them a practical and functional aspect

OBJECTIVES.

Know the most important chemical industrial production processes.
Apply the knowledge acquired in other subjects of the career in industrial reality, with a view to their professional practice.
Know the manufacturing methods of the main chemical products. Introduction to the economy of the sector.
Visit various manufacturing facilities, with process monitoring on site.
Relate energy and production aspects with their environmental impact.
Minimize the damaging effects of large-scale material production
Incorporate the criteria of the "Commitment to Progress" of many of the large chemical companies worldwide.
Promote the development of sustainable chemical manufacturing processes.
Relate production processes to pollution.
Prepare reports based on data from the bibliography and specialized magazines of the different industrial sectors.

SKILLS.

1. Be able to design and manage processes with material balances. TEQI1
2. Acquire knowledge to manage processes with energy balances. TEQI1
3. Understand the transformation techniques of the main raw materials. TEQI2
4. Be able to design procedures for the recovery of energy resources TEQI3
5. Learn the basics of the management of manufacturing processes for different products. TEQI2
6. Design and manage applied experimentation procedures, equipment, and systems management, relating thermodynamic concepts in physical processes TEQI5
7. Develop capacities and acquire skills to design compound synthesis processes applying the TEQI7 safety standards.
8. Acquire the ability to apply the strategies of scientific methodology: propose hypotheses solutions to solve problems of I. Chemistry - TEQI8
9. Be able to adequately communicate knowledge, procedures and results in the field of chemical engineering, using the specific vocabulary and terminology TEQI9.
10. Work effectively in multidisciplinary environments integrating skills and knowledge to make decisions in the field of chemical engineering TEQI10
11. Know, understand and apply the legislation, specifications, regulations and mandatory standards TEQI11
12. Make measurements, calculations, studies and reports, during the completion of each of the practices carried out in the subject TEQI12.

METHODOLOGY
The presentation of the units is done in master classes, with an audio-visual support of graphics, figures and additional

documents. These plugins are available on the "eGela" website.
Theoretical teaching is complemented with assistance to companies in the Chemical Sector, included as Field Practices. From them, reports are prepared on various industrial sectors, including economic and social aspects.
The subject is divided into two balanced parts.
Each part has a theoretical exam, developing several questions and / or problems.
Type of exam: descriptive questions of processes, reactions and applications of the substances studied.
Optional: According to the development of the course, a team work on a sector of the chemical industry will be proposed, to be presented orally and as a team.

TIMING AND TYPE OF TEACHING

M- Master class
S- Workshop
GCA-On site visits

NOTES
For each one of the theoretical topics taught, a Power Point document has been prepared, as well as other electronic documents that are uploaded on the Internet, through the eGela website, so that students can download it on their cell phone and / or personal computer.
In this subject it is intended that the student put into practice the knowledge acquired in the career, both in Chemistry and Engineering, for which it is considered that he must have passed most of the subjects that precede him in the curricular design.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

COMPETENCES / LEARNING OUTCOMES OF THE SUBJECT

The student who takes this subject will acquire the specific competences (CE) and transversal competences (CT) that are listed below.
These competencies are in line with the competencies referred to in the Degree Study Plan (BOE No. 30 of 02/04/2011), whose codes are specified in each case to facilitate their identification.

CODES: [C]Competences typical of the "Degree in Industrial Chemical Engineering" degree; [CRI] competencies common to the "Industrial Branch Engineering"; [TEQI] competencies of the "Industrial Chemistry Module".

SPECIFIC COMPETENCES (CE)

1. Be able to design and manage processes with material balances. TEQI1
2. Acquire knowledge to manage processes with energy balances. TEQI1
3. Understand the transformation techniques of the main raw materials. TEQI2
4. Be able to design procedures for the recovery of energy resources TEQI3
5. Learn the basics of the management of manufacturing processes for different products. TEQI2
6. Design and manage applied experimentation procedures, equipment, and systems management, relating thermodynamic concepts in physical processes TEQI5
7. Develop capacities and acquire skills to design compound synthesis processes applying the TEQI7 safety standards.
8. Acquire the ability to apply the strategies of scientific methodology: propose hypotheses solutions to solve problems of I. Chemistry - TEQI8
9. Be able to adequately communicate knowledge, procedures and results in the field of chemical engineering, using the specific vocabulary and terminology TEQI9.
10. Work effectively in multidisciplinary environments integrating skills and knowledge to make decisions in the field of chemical engineering TEQI10
11. Know, understand and apply the legislation, specifications, regulations and mandatory standards TEQI11
12. Make measurements, calculations, studies and reports, during the completion of each of the practices carried out in the subject TEQI12.

TRANSVERSAL COMPETENCES (CT)

Each one of the transversal competences (CT) corresponds to the competences [C], [CRI] and [TEQI] of the Study Plan that are indicated in each case.
•(CT1) Be able to rigorously use the appropriate terminology to adequately communicate knowledge and express

oneself correctly in oral debates and in technical reports in this field [C4 / C5 / CRI14 / TEQI9 / TEQI12].
•(CT2) Be able to understand (in Spanish and English), interpret and question new scientific-technical information from bibliographic resources - of different types and formats -, developing an interest in learning and the ability to do so autonomously [C10/C12].
•(CT3) Adopt a responsible and orderly attitude, both in individual and cooperative work [C12/CRI16]

Theoretical and Practical Contents

SUMMARY.
The Chemical Industry. Raw Materials. Water as raw materials. Industry of alkali halides and soda. Nitrogen industry. Industry derived from phosphorus. Fertilizers Industry derived from sulfur. Auxiliary industries of construction. Glass and ceramic industry. Oil and its technology. Petrochemical industry. Plastics industry. Rubber and derivatives. Paper industry.

EXPOUNDED SUMMARY.
Unit 1- The Chemical Industry. Raw Materials
Historical development of the Chemical Industry. Basic considerations of the Chemical Industry. Economic importance of the world and Spanish Chemical Industry. Raw Materials in the Chemical Industry. Classification according to its origin. Worldwide distribution of raw materials and their consumption. Types of chemical transformations. Most important commercial chemicals.

Unit 3- Alkaline Halide Industry and Sosa
Separation of dissolved salts. Sodium chloride and derived salts. Electrolysis. Leblanc process. Solvay process. Sodium carbonate and its applications. Obtaining chlorine. Applications of chlorine and soda. Production of sodium. Potassium salts. Sylvinite treatments. Potassium chloride applications.

Unit 4- Nitrogen Industry.
Manufacture of ammonia: Raw materials. Synthesis of ammonia. Obtaining nitric acid by oxidation of ammonia. Nitric acid applications. Other products derived from ammonia: Manufacturing processes and applications.T

Unit 5- Industry derived from Phosphorus. Fertilizers
Phosphate rock as a raw material. Thermal Process: Obtaining elemental phosphorus and calcined phosphates, oxidation of phosphorus and production of thermal acid. Wet decomposition: Manufacture of superphosphates and phosphoric acid. Applications of phosphoric acid and derivatives.
Fertilizers: Nutrient elements of plants. Composition of cultivation soils, progressive depletion of the land, supply of nutrients and amendments. Fertilizers: NPK chemical fertilizers and balanced according to Patart. Formulation and metabolism of fertilizers. Manufacture of ternary fertilizers: Dosing of raw materials.

Unit 7- Auxiliary industries of construction.
Plaster: Transformation by thermal means and putting into work. Derivative products. Limestone: Obtaining lime and use as a binder. Portland cement: Characteristics and applications. Obtaining and composition of clinker. Manufacture of cement and commissioning. Other types of cements.

Unit 6- Industry derived from Sulfur. Raw materials for obtaining sulfur and its derivatives. Pyrite roasting: Use of gases and ashes. Manufacture of sulfuric acid: Catalytic oxidation of SO2, absorption of SO3. Sulfuric acid applications and obtaining its derivatives.

Unit 8- Glass and ceramic industry.
Silica as a raw material. Characteristics and chemical composition of glass. Manufacture of glass. Clay as a raw material. Properties and chemical composition. Manufacture of ceramic materials. Ceramic Industry Products: Characteristics and applications. Other applications of clay.

Unit 10- Oil and its technology.
Origin, extraction and "in situ" treatment of oil. Manufacturing processes in refinery. Initial distillation. Transformation processes of molecules (reforming, cracking, dehydrogenation ...). Synthesis processes (alkylation, polymerization, hydrogenation). Manufacturing schemes. Product debugging. Product applications. Lubricants.

Unit 12- Petrochemical Industry
Starting materials, variety of products and fields of application. Basic petrochemical techniques (separation of species, structural transformation of hydrocarbons: decomposition of hydrocarbons ...). Obtaining synthesis gas, acetylene, olefins and aromatic compounds. Applications and derivative products

Unit 13- Polymer Industry. Rubber and derivatives
General concepts. Compounds involved: Polymers, fillers, reinforcements and additives. The solid state of polymers: glass transition temperature, melting temperature and other conditioning factors. Synthesis, addition, and condensation

polymers. Thermoplastic and thermosetting materials. Transformation of plastics: compression, injection, extrusion. Tree extractable matter. Natural rubber technology: Obtaining, vulcanization process and applications. Manufacture of artificial rubbers. Rubber transformation techniques. Current trends in the elastomer sector.

Unit 14- Paper Industry
Wood constitution. Use of wood: Chemical transformation of cellulose, hydrolysis, pyrolysis. Paper technology: Methods for obtaining chemical pulps. Pastes conditioning. Paper manufacturing

TEACHING METHODS

METHODOLOGY.

MASTER CLASSES.

CE competences will be worked fundamentally.
• Classroom activity: The lecturer will explain the theoretical content and discuss application issues. The students will cooperatively resolve the issues raised by the teacher.
• Non-attendance activity: The student will individually work on the theoretical contents and the questions that are given as work material in each topic (self-assessment).

SEMINARS.

They will be used to carry out the activities related to the part of the program that is developed through the "Problem-Based Learning Methodology" (Items 1, 6, 7 and 8).

Classroom activity: The teacher will present the problem and guide the students in its analysis and resolution. The CE and CT competences indicated in each case will be worked on. Students will analyze the problem, identify learning objectives, and plan assignments.

Non-contact activity: students will carry out the planned tasks to achieve the learning objectives.

CLASSROOM PRACTICES.

COOPERATIVE ACTIVITIES.

They will be carried out. The CE and CT competences indicated in each activity will be worked on. They will be oriented to: (a) the application of the theoretical-practical contents developed in the master classes and (b) to achieve the learning objectives necessary to solve the problem/sub-problems.

Classroom activity: The teacher will present the activity to be carried out. After the activity, each group will present their work.

Non-contact activity: Students will carry out the activity cooperatively. The product of each activity will be a deliverable (includes self-assessment report). There will be an oral presentation of the activity.

TUTORIAL ACTION.

Additional material will be provided to students who need to redirect self-study.

TYPE OF TEACHING.

M- Master class
S- Workshop

NOTES

For each of the theoretical Units taught, a Power Point document has been prepared, as well as other electronic documents that are uploaded on the Internet, through the eGela website, so that students can download it on their cell phone and / or personal computer.
In this subject it is intended that the student put into practice the knowledge acquired in the career, both in Chemistry and Engineering, for which it is considered that he must have passed most of the subjects that precede him in the curricular design.

GCA-On site visits

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	45	5							10
Horas de Actividad No Presencial del Alumno/a	67,5	7,5							15

Legend:
M: Lecture-based
S: Seminar
GA: Applied classroom-based groups
GL: Applied laboratory-based groups
GO: Applied computer-based groups
GCL: Applied clinical-based groups
TA: Workshop
TI: Industrial workshop
GCA: Applied fieldwork groups

Evaluation methods

- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 70%
- Individual assignments 20%
- Teamwork assignments (problem solving, Project design) 10%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

ORDINARY EXAMS CALL: GUIDELINES AND RESIGNATION (SPANISH).
EVALUATION SYSTEM.

This course offers two assessment systems: (A) CONTINUOUS ASSESSMENT or (B) FINAL EXAM.
Students are encouraged to use the continuous assessment system to optimize the learning process and the acquisition of skills.
The lecturer will be informed in writing, prior to week 24, if the chosen evaluation system is option (B).

(A) CONTINUOUS ASSESSMENT (a minimum attendance of 60% is required for theoretical-practical classes)
Includes WRITTEN TESTS and COOPERATIVE ACTIVITIES.

On site practices: Individual works, related to Field Practices: 1 point / 10
To assess the work on the visit it is necessary to have attended. Each job is graded 0-10.
Team work: The work done and its presentation are valued: 1 point.
Taking two theoretical-practical exams, corresponding to two parts of the subject: 7 points / 10
It is necessary to obtain a minimum of 4 points / 10 in the mark of each exam to pass. In that case, the average of both is taken
Class participation: 0.5 point / 10.
To consider class participation, it is required:
Regular
The Final Note corresponds to
Average mark of the partial or final exams: 75%
Note of field practical work: 20%
Class Participation Note: 5%
The evaluation criteria of the detailed previous aspects are published in eGela-Subject Conditions.
Conditions to pass the subject in the final exam in June or July
4 ≤ EXAM grade
FINAL NOTE = (∑ n PARTIAL EXAMS / n) x 0.75 + (∑ n WORKS / n) x 0.2 + Class participation.
In case of not passing the subject, the works are saved for the following course only.

(B) FINAL EXAMINATION

The student must do:
(a) One or two written tests (50% of the final grade). They will include questions and application exercises. Specific skills will be evaluated.
(b) A practical activity (50% of the final mark) - proposal of technological alternatives for the management of RTPs - An oral presentation will be made to evaluate the transversal competences.
It will be necessary to obtain a minimum score of 4/10 in (a) and (b) to mediate and pass the subject (5/10).
RESIGNATION OF CALL:
By writing to the teacher up to 1 month before the end of the teaching period.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

EXTRAORDINARY CALL: GUIDELINES

The student must do:
(a) A written test (50% of the final mark). It will include questions and application exercises. Specific skills will be evaluated.
(b) A practical activity (50% of the final mark) - proposal of technological alternatives for the RTP management -. An oral presentation will be made to evaluate the transversal competences. It will be necessary to obtain a minimum score of 4/10 in (a) and (b) to mediate and pass the subject (5/10).

MANDATORY MATERIALS

BIBLIOGRAPHY

Basic bibliography

Vian Ortuño, Angel. Introducción a la Química Industrial. Ed. Reverté, Barcelona, 2007.
Riegel, E.R. Handbook of Industrial Chemistry. Riegel´s Handbook of Industrial Chemistry. 2004.
Shreve, R. N., Austin, G.T. Chemical Process Industries (5º de.). Mc.Graw Hill, Nueva York. 2000.

Detailed bibliography

Stocchi, E. Industrial Chemistry. Ellis Horwood, Nueva York. 2010
Vincent Vela, María y col. Química industrial orgánica. Universidad Politécnica de Valencia. Servicio de Publicaciones. 2006
Maria R. Gómez Antón y col. Química Inorgánica y orgánica de interés industrial. Madrid 200

Journals

Ingeniería Química
http://www.rbi.es/publicaciones/ingenieria-quimica.htm

Tecnología del Agua
http://www.rbi.es/publicaciones/tecnologia-agua.htm

Residuos
http://www.rbi.es/publicaciones/residuos.htm

Web sites of interest

Chemical Engineering. http://www.rbi.es/publicaciones/ingenieria-quimica.htm
Water Technology. http://www.rbi.es/publicaciones/tecnologia-agua.htm
webs de interés
Federation of Chemical Industries of Spain. http://www.feique.org/
Main companies in the sector. http://www.quimicainfo.com/

OBSERVATIONS

If you do not pass the subject, the grades for the external practice assignments are saved only for the following course.

Universidad del País Vasco Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty 163 - Faculty of Engineering - Vitoria-Gasteiz **Cycle** .

Degree GIAUTO10 - Bachelor's Degree in Automotive Engineering - DUAL **Year** First year

COURSE

25979 - Fluid Mechanics **Credits, ECTS:** 6

COURSE DESCRIPTION

Fluid Mechanics is a key subject of the Second grade in Industrial Engineering in the University College of Engineering at Vitoria-Gasteiz with 6 ECTS credits.

Fluid Mechanics deals with the study of all fluids under static and dynamic situations. Fluid Mechanics is a branch of continuous mechanics which deals with a relationship between forces, motions, and statical conditions in a continuous material. This study area deals with many and diversified problems such as surface tension, Fluid Statics, flow in enclose bodies, or flow round bodies (solid or otherwise), flow stability, etc.

Fluid mechanics is widely used both in everyday activities and in the design of modern engineering systems from vacuum cleaners to supersonic aircraft. Therefore, it is important to develop a good understanding of the basic principles of Fluid Mechanics.

An ordinary house is, in some respects, an exhibition hall filled with applications of Fluid Mechanics. The piping systems for cold water, natural gas, and sewage for an individual house and the entire city are designed primarily on the basis of Fluid Mechanics. The same is also true for the piping and ducting network of heating and air-conditioning systems. A refrigerator involves tubes through which the refrigerant flows, a compressor that pressurizes the refrigerant, and two heat exchangers where the refrigerant absorbs and rejects heat. Fluid mechanics plays a major role in the design of all these components.

All components associated with the transportation of the fuel from the fuel tank to the cylinders, the fuel line, fuel pump, fuel injectors, or carburetors as well as the mixing of the fuel and the air in the cylinders and the purging of combustion gases in exhaust pipes are analyzed using fluid mechanics. Fluid mechanics is also used in the design of the heating and air-conditioning system, the hydraulic brakes, the power steering, automatic transmission, and lubrication systems, the cooling system of the engine block including the radiator and the water pump, and even the tires.

On a broader scale, fluid mechanics plays a major part in the design and analysis of aircraft, boats, submarines, rockets, jet engines, wind turbines, biomedical devices, the cooling of electronic components, and the transportation of water, crude oil, and natural gas. It is also considered in the design of buildings, bridges, and even billboards to make sure that the structures can withstand wind loading. Numerous natural phenomena such as the rain cycle, weather patterns, the rise of ground water to the top of trees, winds, ocean waves, and currents in large water bodies are also governed by the principles of Fluid Mechanics.

The students of the Grade in Industrial Chemical Engineering will apply the knowledge of this subject to others of third year, such as Physical Chemistry, Control of Chemical Processes and Experimentation in Chemical Engineering I. The students of the Grade in Engineering in Automotive, will later apply the knowledge acquired in the subject of Aerodynamics, third year.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

The following course skills are developed:

- Knowledge of basic and technological subjects that enables students to learn new methods and theories, providing them with versatility to adapt to new situations),
- Capacity to solve problems using initiative, decision making, creativity, critical thinking, and to communicate and convey knowledge, abilities and skills in the field of Industrial Engineering, and the cross-curricular competencies

- Adopt a responsible and organised attitude towards work and a willingness to learn taking into account the challenge of the necessary continuous training,

- Apply scientific method strategies: analyse qualitatively and quantitatively the problem situation, propose hypotheses and solutions using industrial engineering models, speciality mechanics, and

- Work efficiently in a group, integrating skills and knowledge to make decisions in the field of industrial engineering.
The competencies and key knowledge that this course programme offers can be used in the following subjects of the grade in Industrial Engineering:
- Hydraulic machinery
- Hydraulic installations
- Pneumatic and hydraulic systems

Theoretical and Practical Contents

In order to get the background knowledge, abilities and skills, the course content is divided into five blocks of learning units: Hydrostatics, Kinematics and Dynamics, Dimensional analysis, similitude and viscous flows, Flow Hydraulic machinery and Installations in pipes and open channels

Theoretical content (chapters):

1. Fluid Mechanics. Basic concepts.
2. Fuid Properties. Basic definitions.
3. General laws of the Fluid Statics.
4. Pneumatics and hydraulics. Basic concepts.
5. Pneumatic and hydraulic circuits.
6. Statics of incompressible fluids in the gravitational field. Hydrostatics.
7. Fluid forces on surfaces.
8. Fluid forces on submerged and floating bodies.
9. Fundamentals of Fluid Kinematics.
10. Mass conservation theorem. The continuity equation.
11. Fundamental equation of Fluid Dynamics.
12. Bernoulli equation.
13. Applications of the Bernoulli equation. Flow meters.
14. Momentum equation. Angular momentum equation.
15. Applications of the momentum equation.
16. Dimensional analysis and dynamical similitude.
17. Viscous flows.
18. Head losses in pipes.
19. Steady flow in conduits and pipes. Multipath pipelines problems.
20. Varying flow in pipes.
21. Steady flow in open channels.
22. Hydraulic machinery. Fundamentals. Turbo machinery.
23. Hydraulic turbines. Hydro electrical stations/plants.
24. Hydraulic pumps.
25. Pumping installations/stations.

Practical content:

The students will perform 17 or 18 laboratory experiments.

1. Measurement of viscosity of a fluid
2. Rigid-body rotation of fluids
3. Fluid forces on surfaces
4. Verification of Bernoulli equation
5. Discharge in tanks
6. Study of Flow meters
7. Use of Weirs
8. Forces exerted by fluid jets
9. Study of primary (friction) head losses in pipes.
10. Study of secondary (minor) head losses in pipes.
11. Determination of cavitation in pipes.
12. Analysis of Pelton turbines
13. Analysis of centrifugal pumps
14. Centrifugal fan.
15. Time to empty a tank containing a liquid.
16. Water hammer
17. Wind tunnel
18. Pneumatics and hydraulic systems

Required materials (background, instructions, and lab report template) are posted on the course. Students will be assigned into groups/teams formed by three students, to perform the experiments. Group lab reports will be submitted after finish the lab.

Attendance to the laboratory sessions is compulsory.

TEACHING METHODS

The course is geared towards self-learning and uses participatory approaches as much as possible. A cooperative learning (AC, Aprendizaje cooperativo) methodology will be used, including lecture/presentation, group work , demonstrations, case studies, problem solving practical sessions (hands-on practice), small and large group exercises and role plays. The attendees roles and responsibilities will be change in the group/team.

The course objectives are:

- To introduce definitions, concepts, properties, principles, laws, observations and models of ideal and real fluids at rest and in motion.

- To provide basis for understanding fluid behavior at rest and in motion (laminar, turbulent) and for engineering design and control of fluid systems.

- To develop competence with mass, energy and momentum balances for determining resultant interactions of flows and engineered and natural systems.

- To develop basis for correlating experimental data, designing tests, and using scale models of fluid flows.

- To learn nature of rotation, circulation, resistance (viscous, turbulent), boundary layers and separation with applications to drag and lift on objects

- To learn methods for computing head losses (friction and fitting losses) and flows in simple pipes and channels.

- To learn the fundamentals of pumps and hydraulic turbines and the way they operate.

- To identify and understand how the key elements work: compressor, cooler, separator, actuators, valves and accessories involved in pneumatic and hydraulic facilities.

- To solve engineering problems associated with pneumatic and hydraulic installations, designing a series of practical circuits.

- To contribute primarily to the students' knowledge of college-level mathematics and/or basic sciences and provide experimental experience.

The student will be able:

- To interpret, define and solve practical problems related with the nature of different types of fluids and their interactions on engineered and natural systems in order to develop technical projects.

- To identify, interpret and explain the terminology, the structural characteristics, key parts, operation and application fields of pumps and hydraulic turbines and manage that knowledge to choose the suitable machine for every installation, according to technical criteria.

- To prepare, present, defend, orally and in writing, and make reports on the subject working individually or in groups.

- To analyze, interpret and synthesize a Technical Project related to Fluid Mechanics.

The laboratory experiments, team project and homework assignments will be performed in groups in cooperative work.

A team project titled "Design and calculation of a pumping installation" will be performed in groups. The student group will have to identify and set all the parameters involved in the project according to the instructions provided by the teachers.

The student groups will co evaluate the work made by the rest of the groups as for instance the team project.

The following individual or group assignments will be made along the course:

- Initial opinion survey on the subject
- Group/team meeting minutes
- 5/6 homework assignments
- Individual pop quizzes
- A mid-term exam
- Project Design sheet (planning sheet)
- First part of the Project Report
- Final Project Report

- Public presentation of the project

An evaluation will be expected at the end of the semester for students to give feedback on the course, and to outline what they have learned based on:

- Evaluation sheet
- Final Opinion survey

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	45			15					
Horas de Actividad No Presencial del Alumno/a	67,5			22,5					

Legend:
M: Lecture-based | S: Seminar | GA: Applied classroom-based groups
GL: Applied laboratory-based groups | GO: Applied computer-based groups | GCL: Applied clinical-based groups
TA: Workshop | TI: Industrial workshop | GCA: Applied fieldwork groups

Evaluation methods

- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 30%
- Exercises, cases or problem sets 30%
- Teamwork assignments (problem solving, Project design) 30%
- Oral presentation of assigned tasks, Reading¿ 10%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The course's assessment will be continuous, based on two mid-term examinations, weekly homework assignments, pop quizzes, and the realization of a laboratory report and a technical project based on the design of a pumping system.

Homework assignments: 20 % Team work
Mid term exam: 30 % Chapters: 1-17.
Laboratory Report: 15 % Team work
Technical Project: 35 % Team work

More specifically explained:

20%. Submission and assessment of homework assignments (deliverables or tasks assigned for the different topics). When students submit less than 80% of homework assignments, they will receive the grade Not submitted. The quality of the group assignment will also be taken into account.

30%. Students will take a mid term exam prior to carrying out the project.

15%. Report on laboratory practice, carried out in groups/teams. Completion of lab practice and corresponding report is compulsory in order to pass the subject. The quality of team work will also be taken into account.

35%. Completion of a Team Technical Project. The project evaluation will be function of the oral project presentation (presentation depending on the number of students enrolled in the academic course), the quality of the team work performed, as well as the individual evaluation tests and/or groups that are held during the last 5 weeks of the course.

- To pass the course, students are required to pass the two mid term exams.
- Students failing the mid-term exams will have the choice to pass a retake exam in May.
- Only the students fulfilling the requirements of the Official College Regulations (Article 43.1, Section c) will have the right to take a final ordinary exam.

- The students not attending to class or laboratory sessions or project classes or submitting less than 80% of the homework assignments will be Not Evaluated.

- There will be a final ordinary exam at the end of the course semester (in May) for those students who failed to pass the course by the previously explained evaluation method.

SOME REMARKS:

- Final exam in June's call: for the student who does not pass the subject by continuous assessment. 100% of the mark.

For students to justify the impossibility of continuous evaluation in the direction of the School:

- Final exam (call for May and June). 100% of the mark.

Article 43 of the Management Regulations for the teaching of undergraduate and first and second cycle, provides the proper reasons for non-participation in the continuous assessment (work reasons, victims of domestic violence, birth, adoption, foster care or daughters and children under three years in charge, care of dependent family member, students with disabilities equal to or greater than 33%, high-level athlete, artistic / cultural activities that involve travel or dedication, compatibility with other higher education, compatibility with political office , union, student representation, associations, NGOs, or other).

Once the student has taken part in a partial continuous assessment tests, it is assumed that you are following the continuous evaluation and get a final score calculated by weighting all tests. ONLY if they are not present at any of the tests, you get a rating of "not presented".

Students not performing the Laboratory experiments or the Project will receive the mark of NOT PRESENTED in the corresponding call.

Students who fail to pass the course according to the previously explained system of continuous evaluation will have the choice to take a final exam in the corresponding ordinary and extraordinary calls (June, July).

The students who decide not to follow the course according to the previously explained system of continuous evaluation will notify the waiver (renunciation) of continuous assessment to the teacher, and they will have the choice to take a final exam in the regular examination calls where all competencies and learning outcomes identified will be evaluated.

The waiver or renunciation of continuous evaluation may be applied during the teaching period of the subject. In any case, students which are not able to attend class on a regular basis because they are working or complying with the requirements of the management regulations for the first and second cycle courses, are asked to contact the teaching staff for an adapted program of development of competences and learning objectives of the subject.

Students who do not participate in the exams and/or in the project and/or in the laboratory practices, will receive the qualification of Not Presented in the corresponding call.

The final exam will be the same for all the groups.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

- The student failing the course will also have the choice to take a final extraordinary exam in June based on all the contents and problems studied all along the course.

MANDATORY MATERIALS

Most part of the folllwong teaching material will be available on E-gela:

Teacher resource notes
Tables and diagrams
Laboratory manual
PowerPoint presentations (slides)
Solved exams
Problem statements and solutions
Student guide, course project guide
Appendices (minutes, forms, sheets)
Homework assignments

BIBLIOGRAPHY

Basic bibliography

Most part of the bibliography listed for the subject and more can be found on the signature 532 in the Biblioteca de las Nieves library.

Fluid Mechanics. Fundamentals and Applications. Cengel, Y.A, J.M. Cimbala. 2nd Edition in SI units. Mc Graw Hill. 2009. Signature: 532CEN (Sala Font Quer).

Fluid Mechanics. F.M. White. 7th Edition. Mc Graw Hill, 2011. ISBN: 978-007-131121-2.

Mecánica de Fluidos Incompresibles y Turbomáquinas Hidráulicas. Agüera Soriano, José. 5ª Edición. Edit. Ciencia. 2002.

Mecánica de los Fluidos, V.L. Streeter, E.B. Wylie. 9th Edition Mc Graw Hill, 2000. ISBN: 958-600-987-4.

Introducción a la Mecánica de Fluidos. Fox, R.W. McDonald, A.T. 4ª Edition McGraw-Hill. 1995.

Fundamentos de Mecánica de Fluidos. Gerhart, P.M, Gross,R.J. y Hochstein, J.I., 2ª Edición. Ed. Addison-Wesley Iberoamericana S.A. 1995.

Fox, R.W. McDonald, A.T. Introducción a la Mecánica de Fluidos. 4ª Ed. McGraw-Hill. 1995.

Gerhart, P.M, Gross,R.J. y Hochstein, J.I. Fundamentos de Mecánica de Fluidos, 2ª edición. Ed. Addison-Wesley Iberoamericana S.A. 1995.

Detailed bibliography

Introductory Fluid Mechanics. J. Katz. Cambridge University Press. 2010. ISBN: 978-0-521-19245-3.

Mechanics of Fluids. Potter, M., D. Wiggert. 3rd Edition. Thomson, 2002. ISBN: 970-686-205-6.

Applied Fluid Mechanics. R.L. Mott. 6th Edition. Pearson Prentice Hall, 2006. ISBN: 0-13-197643-5.

Mecánica de Fluidos. Shames, Irving H. Mc Graw-Hill. 1995.

Fluid Mechanics with Engineering Applications. Finnemore, E.J. y Franzini, J.B. 2002.

Engineering Fluid Mechanics. Crowe, Elger, Williams and Roberson. 9th Edition. Wiley & Sons, Inc. 2010. ISBN: 978-0-470-40943-5.

Journals

- Computers and Fluids
- El instalador
- Environmental Fluid Mechanics
- European Journal of Mechanics. Series B. Fluids
- Experimental Thermal and Fluid Science
- Experiments in Fluids
- Flow Measurement and Instrumentation
- Fluid Dynamics Research
- Fluidos
- Geophysical and Astrophysical Fluid Dynamics
- Ingeniería Del Agua
- International Journal of Multiphase Flow
- International Journal of Heat and Fluid Flow
- International Journal of Heat and Mass Transfer
- Journal of Fluid Mechanics.
- Journal of Fluids Engineering
- Journal of Hydraulic Engineering
- Journal of Non-Newtonian Fluid Mechanics
- Montajes e instalaciones
- Physicochemical Hydrodynamics
- Physical review A. Statistical physics, plasmas, fluids, and related interdisciplinary topics
- Physical review E. Statistical physics, plasmas, fluids, and related interdisciplinary topics
- Physics of fluids
- Physics of fluids A. Fluid Dynamics
- Tecnología del agua

Web sites of interest

- Hydraulic Institute. www.pumps.org
- Pump-Flo Co. www.pump-flo.com/manulist.asp
- Animated software company, www.animatedsoftware.com
- Pumps and systems magazine: www.pump-zone.com.
- http://www.sc.ehu.es/sbweb/fisica/fluidos/estatica/introduccion/Introduccion.htm.
- National Committee for Fluid Mechanics Films (NCFMF) http://web.mit.edu/fluids/www/ Shapiro/ncfmf.html
- IIHR- Hydroscience & Engineering, College of Engineering, The University of Iowa. http://www.iihr.uiowa.edu/:
- Enciclopedia básica sobre fluidos: http://hyperphysics.phy-astr.gsu.edu/ hbase/ fluid.html#flucon
- Principios de aeronáutica: http://wings.avkids.com/Libro/advanced.html
- Simulación de redes de distribución de fluidos: http://www.epa.gov/nrmrl/wswrd/dw/epanet.html

- UNESCO-IHE Institute for Water Education: http://www.unesco-ihe.org/
- Manual de vuelo: http://www.inicia.es/de/vuelo/

OBSERVATIONS

Tutorials: The students have a schedule of tutorials to deal with all issues related to the subject. Its use is encouraged to support the acquisition of the competences of the subject with the close support of the teacher, who is available to attend and help students. Outside the tutoring hours there will be no problem in attending students, whenever possible. It is recommended by appointment.

Universidad del País Vasco — Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty 163 - Faculty of Engineering - Vitoria-Gasteiz **Cycle** .

Degree GIAUTO10 - Bachelor's Degree in Automotive Engineering - DUAL **Year** Second year

COURSE

28126 - Structure design in Automotive Engineering **Credits, ECTS:** 6

COURSE DESCRIPTION

The subject of Calculation and Design of Automobile Structures constitutes an introduction to the elasticity and strength of materials and their application in the field of automobile design.
The elasticity and strength of materials is the science that studies the behavior of the deformable solid. It can be contextualized within the subjects of Applied Mechanics. When studying solids, two types are distinguished: rigid solid and deformable solid. In this subject, it will be considered that solids are deformable. These elements have a simple geometry, and allow the use of calculation hypotheses.

This subject incorporates fundamental aspects to be considered in the design of automotive structures that are applied to different products, considering aspects related to strength, safety, deformation, type of materials used and price.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

GENERAL CFB1 Apply the strategies of the methodology in Engineering: to analyze the problematic situation qualitatively and quantitatively, to propose hypotheses and solutions using the Engineering models in the Automotive area.
RA1 Applies material strength knowledge to simple geometry cases of columns and beams subjected to forces and moments to know the tensile state and related deformations.
TRANSVERSAL CT2 Adopt a responsible, orderly attitude at work and ready to learn considering the challenge of the necessary continuing education.
RA2 Applies the knowledge of strength of materials and structures to solve theoretically presented conceptual issues using specific vocabulary and terminology.
TRANSVERSAL CT3 Ability to solve problems with initiative, decision making, creativity, critical reasoning, leadership and to communicate and transmit knowledge, and skills.
RA3 Correctly expresses in writing, in a graphic and orderly way, the resolution methods, results and aspects inherent to the problem posed by the calculation, and the design of structures using specific vocabulary and terminology.
SPECIFIC FB6 Understanding and mastery of the basic concepts about the general laws of mechanics, and their application for the resolution of problems related to automotive engineering.
RA4 Solve the proposed exercises in class individually in the field of calculation and structure design, properly applying the strategies typical of the scientific methodology: to analyze the problematic situation qualitatively and quantitatively.
SPECIFIC FI5 Knowledge and use of materials strength principles for application to Automotive Engineering.
RA5 Works effectively as a group to solve the proposed exercises to estimate the stress and strain states of simple geometry pieces.
BASIC CB4 Know how to transmit information, ideas, problems and solutions to a specialized and non-specialized audience.
RA6 Works effectively as a group. It seeks information, poses hypotheses and solutions integrating capabilities and knowledge for the design and calculation of a part of the structure. Expose the results to other colleagues.

Theoretical and Practical Contents

1.- Introduction to the strength of materials
2.- Tensile and compression
  2.1.- Normal forces
  2.2.- Stress and deformation state in tensile and compression
3.- Bending
  3.1.- Generalities
  3.2.- Simple bending
  3.3.- Oblique or deviated bending
  3.4.- Compound bending
4.- Torsion
  4.1.- Generalities
  4.2.- Torsion and bending
5.- Internal potential energy for different stress states: tensile, bending and torsion

TEACHING METHODS

In the theoretical lectures, the theory will be explained and related examples will be solved.
In classroom practices, theoretical concepts can be explained and exercises to be developed proposed.
In class, the lecturer will propose some works, which can be problems, practices or exercises to work on theory.
During the first part of the subject, the following tasks will be performed:
- Individual and non-presential written exercises
- Group and non-presential written exercises
In the second part of the subject, the following tasks will be performed:

- Presential and non-presential group project calculation and/or design of an automotive structure
- Oral presentation of such project to the rest of the students

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	15		30	15					
Horas de Actividad No Presencial del Alumno/a	22,5		45	22,5					

Legend:
M: Lecture-based | S: Seminar | GA: Applied classroom-based groups
GL: Applied laboratory-based groups | GO: Applied computer-based groups | GCL: Applied clinical-based groups
TA: Workshop | TI: Industrial workshop | GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 40%
- Oral defence 5%
- Exercises, cases or problem sets 20%
- Individual assignments 20%
- Teamwork assignments (problem solving, Project design) 15%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Students who consider this will be able to present their resign of continuous assessment until the ninth week after the beginning of the four-month period, following the procedure described in the regulations and within the period indicated by the regulations of teaching planning and evaluation of the E/A. It will also be communicated to the teacher responsible for the subject. The regulations are in the following link: http://www.ehu.eus/es/web/estudiosdegrado-gradukoikasketak/ebaluaziorako-arautegia

CONTINUOUS ASSESSMENT

Individual and non-presential written exercises. The mark shall correspond to the arithmetic average of the exercises delivered through eGela (if no exercise is delivered in due time, the rating shall be 0). Weighting percentage in relation to the final mark: 20%
Non-presential group written exercises. The mark shall correspond to the arithmetic average of the exercises delivered through eGela (if no exercise is delivered in due time, the rating shall be 0). The mark will be for the group, same for all members. Weighting percentage on final mark: 20%
Individual written tests. Weighting percentage of the final mark: 40%.
Presential and non-presential group project to calculate and/or design a car structure. Weighting percentage of the final mark: 15%.
Oral presentation of this project. Weighting percentage of the final mark: 5%.

Note: it is essential to obtain in each written examination 4.5 points out of 10 in order to apply the percentages described in the continuous assessment. For students who do not get it, if they have done everything else, they will be offered the possibility to do another written exam during the course.

FINAL EVALUATION

Individual written examination. Weighting percentage of the final mark: 40%.

Individual written practical exercise to design and calculate an automotive structure. Weighting percentage of the final mark: 50%.

Oral presentation of this project. Weighting percentage of the final mark:10%.

Note: It is a prerequisite to pass the subject, obtain in each written exam 4.5 points out of 10.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The same as in ordinary call.

MANDATORY MATERIALS

Theory and problems explained during lectures.

BIBLIOGRAPHY

Basic bibliography

Timoshenko. Resistencia de materiales (James M. Gere) Editorial Paraninfo
Mecánica para ingenieros (M. Vázquez y E. López) Editorial Noela
Luis Ortiz Berrocal. Resistencia de Materiales. Editorial Mc Graw Hill
Joseba García Melero. Resistencia de Materiales. Editorial: UPV-EHU
Joseba García Melero. De Leonardo da Vinci y Galileo a Mariotte. Editorial: Raima
Joseba García Melero. De Parent y Coulomb a Navier y Saint-Venant. Editorial: Raima.

Detailed bibliography

Material curso OCW diseño de máquinas
SHIGLEY, S.E.: "Diseño en Ingeniería Mecánica".
Robert. L. Norton. "Diseño de Maquinaria".
Robert L. Mott "Diseño de Elementos de Máquinas".
Carlos Angulo, Luis Norberto López de Lacalle, Josu Agirrebeitia, Charles Pinto. "Elementos de Máquinas".
M.F. Spotts. "Proyecto de elementos de máquinas".

Journals

Web sites of interest

OBSERVATIONS

In the event that a face-to-face assessment of the subject cannot be carried out, the pertinent changes will be made to carry out an on-line assessment by using the existing IT tools at the UPV/EHU. The characteristics of this on-line assessment will be published in the student guides (annex or action plan) and in eGela.

Universidad del País Vasco — Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty 163 - Faculty of Engineering - Vitoria-Gasteiz **Cycle** .

Degree GIAUTO10 - Bachelor's Degree in Automotive Engineering - DUAL **Year** Second year

COURSE

28132 - Finite Element Simulation and Analisys in Automotive Engineering **Credits, ECTS:** 6

COURSE DESCRIPTION

This subject is the continuation of the one studied in the first four-month period "Calculation and design of automobile structures". In the subject of the first semester the basic theoretical knowledge of mechanical calculation will be explained and analytically applied.
In the present subject the students will work numerically, using a calculation software.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

Knowledge and use of the principles of the strenght of materials for the simulation and analysis using the Finite Element Method in automotive.
The expected learning results are:
- Apply knowledge of strenght of materials applied to automotive examples and the use of appropriate computer tools.
- Solve the problems of strenght of materials by means of qualitative and quantitative analysis and to propose suitable solutions using the appropriate models.
- Prepare written and oral reports, expressing adequately theoretical knowledge, methods of resolution and results obtained.
- Work on projects applying the appropriate legislation or regulations.
- Analyze and evaluate the social and environmental impact by applying sustainability criteria.

Theoretical and Practical Contents

- Structural analysis. The matrix method.
- Finite element method: Preprocess-process-postprocess.
- Linear and non-linear analysis, application examples.
- Finite elements in dynamics. Modal analysis, theory of vibrations.

TEACHING METHODS

Theoretical contents based on the resistance of materials and the method of finite elements will be explained in master clasess.
In classroom practices, exercises will be carried out first analytically and then numerically using the specific software. And finally results obtained will be compared.

The first sessions of computer practices will be an overview of some tools of finite element calculation software.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	15		15		30				
Horas de Actividad No Presencial del Alumno/a	22,5		22,5		45				

Legend:
M: Lecture-based — S: Seminar — GA: Applied classroom-based groups
GL: Applied laboratory-based groups — GO: Applied computer-based groups — GCL: Applied clinical-based groups
TA: Workshop — TI: Industrial workshop — GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Oral defence 10%
- Exercises, cases or problem sets 40%
- Teamwork assignments (problem solving, Project design) 20%
- PRUEBA REALIZADA EN ORDENADOR 30%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Se realizará evaluación continua en base al sistema de evaluación presentado.

En el caso de que no se pueda realizar una evaluación presencial de la asignatura, se realizarán los cambios pertinentes para la realización de una evaluación on line mediante la utilización de las herramientas informáticas existentes en la UPV/EHU. Las características de esta evaluación on line será publicadas en las guías de estudiante y en eGela.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

El alumnado tendrá que evaluarse de la parte que tiene suspendida.

En el caso de que no se pueda realizar una evaluación presencial de la asignatura, se realizarán los cambios pertinentes para la realización de una evaluación on line mediante la utilización de herramientas informáticas existentes en la UPV/EHU. Las características de esta evaluación on line será publicadas en las guías de estudiante y en eGela

MANDATORY MATERIALS

- Teachers notes

BIBLIOGRAPHY

Basic bibliography

- Teachers notes

Detailed bibliography

-The Finite Element Method, O.C. Zienkiewicz. Ed Reverté.

Journals

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Web sites of interest

OBSERVATIONS

Universidad del País Vasco — Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty 163 - Faculty of Engineering - Vitoria-Gasteiz **Cycle** .

Degree GIAUTO10 - Bachelor's Degree in Automotive Engineering - DUAL **Year** Third year

COURSE

28138 - Automotive Technology Manufacturing Processes **Credits, ECTS:** 6

COURSE DESCRIPTION

The subject ‘Manufacturing Processes in Automotive Technology’ aims to introduce students to the most relevant metal-mechanical manufacturing processes in the automotive sector and to familiarise them with the most significant elements and characteristics of each of them.

The main objectives are:

1.- To provide a general overview and basic information related to the Metal-Mechanical Manufacturing Industry.

2.- To introduce the characteristics and capabilities of the main M-M manufacturing processes (welding, moulding, plastic forming and material removal).

3.- To establish the fundamentals and criteria to know how to choose the appropriate manufacturing process for a specific type of part.

4.- To know the basic procedures for the measurement and verification of parts.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

Starting from product design and knowledge of materials, the subject Manufacturing Processes in Automotive Technology establishes the fundamentals of knowledge and the application of metal-mechanical forming processes in a logical sequence according to their location in the production context. Hence the multidisciplinary character of the subject, and the large number of interrelationships with other fields or areas of knowledge.
This discipline is responsible for the identification and characterisation of the different factors involved in the mechanical transformation processes undergone by a material (mainly metals and their alloys), from when it has been produced in its raw state until it is transformed into a finished product, as well as the parameterisation of these factors and the establishment of the limits for their control.

The aim is to develop the basic knowledge and skills for the selection, design and control of metal-mechanical manufacturing processes, from the production of unitary parts to the production of large series, paying special attention to the criteria of flexibility and production costs and to the relations with other fields of knowledge in Engineering.

Theoretical and Practical Contents

METROTECHNICS

Introduction to Metrology. Characteristics of measurements. Measuring instruments and standards. Tolerances. Measurement uncertainty. Acceptance tolerances. Analysis of a measurement system. Statistical control of manufacturing processes.

JOINING OF METALLIC ELEMENTS. WELDING

Basic welding concepts. Weldability of metals. Contribution energy. Cooling and solidification. Metallurgy of welding. Homogeneous electric arc welding (fundamentals and most characteristic processes). Homogeneous electric resistance welding Heterogeneous welding

SHAPING BY MOULDING

Sand moulding. Fundamentals and classification. Elements of the mould. Process design. Introduction to automated processes. Shell moulding. Investment casting. Permanent mould casting. Gravity, Low pressure, Injection.

PLASTIC METAL FORMING
Introduction to the theory of plastic deformation. Processes and products. Types of processes. Hot deformation processes. Forging. Continuous and semi-continuous processes. Rolling, extrusion, drawing and drawing. Cold deformation processes. Sheet metal forming. Types of machines.

MACHINING BY CHIP REMOVAL

Introduction to machining processes. Classification. Machinability. Forces in machining. Fundamentals of cutting tools. Processes: Turning and milling. Types of machines. Introduction to Numerical Control - CNC. Economics of machining.

TEACHING METHODS

The lectures will serve to explain the theoretical foundations of manufacturing processes and those subjects that are closely linked to their development and control, trying to describe the multiple existing relationships with other disciplines and with the application of the knowledge that will be acquired in other engineering specialities. In the same way, the conceptual bases are established for the workshop and laboratory practicals and for the resolution of practical exercises of medium complexity.

In the workshop and laboratory practicals, some of the knowledge acquired in the lectures will be put into practice through the use of the software, instruments and machinery available in each case.

The workshop and laboratory practicals will be carried out in groups composed of a maximum of 25 students who will be organised into teams of two, maximum three students (depending on the practical), who will develop the practical by integrating skills and knowledge. In those cases in which, for reasons of space, safety or capacity of the available equipment, the number of participants must be limited, the practical group will be subdivided into two subgroups of twelve or thirteen members each.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	30			15	15				
Horas de Actividad No Presencial del Alumno/a	45			22,5	22,5				

Legend:

M: Lecture-based | S: Seminar | GA: Applied classroom-based groups
GL: Applied laboratory-based groups | GO: Applied computer-based groups | GCL: Applied clinical-based groups
TA: Workshop | TI: Industrial workshop | GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 30%
- Exercises, cases or problem sets 20%
- Teamwork assignments (problem solving, Project design) 30%
- Oral presentation of assigned tasks, Reading¿ 10%
- CORRECCIÓN DE PROYECTOS 10%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The assessment of the ordinary exam will be carried out according to the following criteria:

1) Assessment of the workshop or laboratory practicals: up to a maximum of 20% of the joint grade.

2) Assessment of mastery and/or knowledge of the contents of the lectures and the corresponding application exercises: up to a maximum of 40% of the overall grade.

3) Assessment of PBL project-based learning: up to a maximum of 20% of the overall grade.

4) The previous evaluations will be complementary and their respective grades will add up to a maximum of 100% of the final joint grade, having to pass both independently to pass the subject as a whole. The first practical class of the term will be introductory and students will be informed about the details of the process of both evaluations and the minimums to be reached in each case.

5) Unexcused absence from two or more practical sessions will mean the automatic loss of 20% of the maximum grade achievable in the evaluation as a whole for workshop or laboratory practices.

100% of the grade may be obtained by means of the written theoretical-practical exam in the case that the student chooses the ‘Final Evaluation System’ for which he/she will have to communicate it in writing to the teacher of the master classes of his/her group within nine weeks from the beginning of the course.

In other cases, the weighted sum of the marks obtained in the evaluation of the lecture contents and application exercises and the evaluation of the workshop and laboratory practicals shall be applied, and the condition expressed in points 3 and 4 shall be fulfilled in all cases.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

In the extraordinary call, there will be a single test or final exam (written test) in which all the contents developed during the course will be covered.

If the student does not take the exam in the ORDINARY or the EXTRAORDINARY exam, he/she will get a ‘No-show’ regardless of his/her participation in the workshop or laboratory practicals.

MANDATORY MATERIALS

Documentation and information provided by the teaching staff of the subject.

BIBLIOGRAPHY

Basic bibliography

The bibliography is specific to each topic, although there are two books that cover most of the topics in a consistent manner.

Tecnología Mecánica y Metrotécnia Coca Rebollero, Pedro and Rosique Jiménez, Juan
Publisher: Pirámide

Manufactura. Engineering and Technology Kalpakjian, Serope and Schmid, Steven R.
Publisher: Pearson Educación

The aim of these texts is educational and not informative. For this reason, in the writing of each chapter, the process is analysed rather than described so that the reader, at each stage, can assess the influence of the parameters involved. Thus, when studying rolling, for example, the analysis of the thermal-mechanical process of the passage of the material between the rolls is more in-depth, and the lengthy (to be read) description of the rolling mills is dealt with very succinctly, as it does not change the essence of the process, whether the roll is more or less. The same can be said of casting technology, welding methods, etc.

Detailed bibliography

Journals

Web sites of interest

OBSERVATIONS

The evaluation will be face-to-face, however, if the health conditions are not suitable, an online evaluation will be chosen, which will be perfectly explained in the student's guide in Egela.

Universidad del País Vasco — Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty 163 - Faculty of Engineering - Vitoria-Gasteiz **Cycle** .

Degree GIAUTO10 - Bachelor's Degree in Automotive Engineering - DUAL **Year** Fourth year

COURSE

28141 - Advanced Automation in Vehicle Production **Credits, ECTS:** 4,5

COURSE DESCRIPTION

Automation is a basic pillar of the automotive industry, both as a tool for improving productivity and as a process of continuous innovation. In this subject, the integration of the different technologies structured in the automation pyramid is undertaken, through the implementation of communication systems commonly used in the industry.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

The optional subject contributes to acquiring greater capacity in the competencies defined for this degree. Specifically, it delves into the acquisition of knowledge based on computational tools, their application in manufacturing processes and the automation of industrial plants.

As a result of learning:

· The student knows the Automotive Pyramid and its levels. He differentiates the function of each level.

· The student knows the concept of Industry 4.0 and its characteristic elements.

· The student knows how to use the different software tools that are integrated into an industrial automation project.

· The student uses the different industrial communication standards available for the connection of these tools.

· The student manages the fundamental elements that enable him to face complex projects of automation and digital integration in the automotive industry.

Theoretical and Practical Contents

· Automotive Pyramid

· Industry 4.0

· PLC programming: HMI, high-level language...

· Communications between programmable automatons

· OPC UA communication protocol

· Web servers in the automation environment

* MQTT communication protocol

TEACHING METHODS

The theoretical part of the subject will focus on aspects related to the Automation Pyramid, reviewing each of the fundamental levels collected there. The Industry 4.0 concept will also be studied. The teacher will explain the different topics. An attempt will be made to have professional experts give talks on the different aspects of the syllabus. To complete this part of the course, students must complete a group project on a related topic.

In the practical part of the subject, the necessary programming knowledge related to the points of the syllabus will be explained. Examples will be proposed and exercises and projects based on them will be carried out.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	15			30					
Horas de Actividad No Presencial del Alumno/a	22,5			45					

Legend: M: Lecture-based · S: Seminar · GA: Applied classroom-based groups · GL: Applied laboratory-based groups · GO: Applied computer-based groups · GCL: Applied clinical-based groups · TA: Workshop · TI: Industrial workshop · GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Exercises, cases or problem sets 65%
- Teamwork assignments (problem solving, Project design) 35%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The default evaluation method is continuous evaluation, which will be graded as follows

Completion of practices (exercises, problems): 65%

Team work (projects): 35%

According to the Regulations governing the Evaluation of Students in official Degrees, chapter II, article 8, section 3, all students will have the right to be evaluated through the final evaluation system, regardless of whether or not they have participated in the continuous evaluation system. To do this, students must submit in writing to the teaching staff responsible for the subject the resignation to continuous assessment. Students will have a period of 9 weeks from the beginning of the semester, in accordance with the center's academic calendar to submit their resignation.

The Final Evaluation will consist of a written test and a practical exercise that will comprise 70% and 30% of the subject, respectively. It will be necessary to pass each of the parts.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

According to the Regulations governing the Evaluation of Students in official Degree degrees, chapter II, article 9, section 2, this type of evaluation will be carried out exclusively through the final evaluation system. Likewise, according to section 3 of the aforementioned article, said test could consist of as many exams and evaluation activities as necessary.

MANDATORY MATERIALS

Given the high technological component of the subject and the great dynamism of the technologies it studies, the teaching team of the subject will indicate at the beginning of the same the material of obligatory use in it (if any).

BIBLIOGRAPHY

Basic bibliography

There is no invariably up-to-date reference bibliography. Therefore, following the methodology used in academic research, the student will be shown how to obtain a personalized bibliography, which is adapted to their specific needs and oriented towards their future professional career.

Detailed bibliography

In the same way, It is not posible to provide an invariable advanced bibliography. The student's training in the methodology of scientific research will allow him to obtain this bibliography in a personalized way and oriented to his professional interests.

Journals

The student's training in the methodology of scientific research will allow him to access scientific journals oriented to his professional interests.

Web sites of interest

Students will be trained to search for web links that are useful for their learning.

OBSERVATIONS

Universidad del País Vasco — Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty 163 - Faculty of Engineering - Vitoria-Gasteiz **Cycle** .

Degree GIEIAU10 - Bachelor's Degree in Industrial Electronics and Automation Engine **Year** Third year

COURSE

25996 - Digital Electronic Systems **Credits, ECTS:** 6

COURSE DESCRIPTION

Digital Electronic Systems is a compulsory third-year course that aims to introduce students to the design of 8-bit microcontrollers and the most common peripherals and protocols.

The types of devices mentioned are at the core of any electronic equipment manufactured today, making this course highly practical.

It is advisable to have developed the competencies acquired in Digital Electronics and Fundamentals of Computer Science to effectively tackle this course. Additionally, it serves as a starting point for the Embedded Systems and Microelectronics courses in the fourth year.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

C3 - Knowledge in basic and technological subjects, enabling them to learn new methods and theories, and providing them with the versatility to adapt to new situations.
C4 - Ability to solve problems with initiative, decision-making, creativity, critical reasoning, and to communicate and transmit knowledge, skills, and abilities in the field of Industrial Engineering.
C6 - Ability to handle specifications, regulations, and mandatory standards.
C10 - Ability to work in a multilingual and multidisciplinary environment.
TEEOI3 - Knowledge of the fundamentals and applications of digital electronics and microprocessors.

As a learning outcome, students will be able to:
Design and synthesize digital systems based on microprocessors and microcontrollers.

Theoretical and Practical Contents

The theoretical topics covered are:
- 8051 Architecture
- Code and data memory
- Interrupts and integrated peripherals
- 8051 Programming in assembly language
- Asynchronous communications RS232 and RS485
- Synchronous communications I2C and SPI
- I/O peripherals: key matrices, LCDs
- Voltage supervisors and watchdogs

The laboratory practices are as follows:
- IDE and code generation
- Debugging/simulation
- Functions and loops
- GPIOs
- Stepper motor
- Audio generation
- Serial port
- Control of an alphanumeric LCD
- Control of an I2C LED driver
- Reading a 4x4 keyboard

TEACHING METHODS

In lectures, the focus is on enhancing knowledge of basic subjects and technologies that enable learning new methods and facilitate adaptation to new situations. This will be supported by handling specifications and standards published by manufacturers and consortia.

Datasheets and manuals of the studied peripherals will be used as a guiding thread. Based on these, relevant explanations will be provided so that simple implementations demonstrating the discussed functionality can be carried out in practical sessions.

In practical classes, this documentation will be used to solve problems with initiative, creativity, and critical reasoning, applying strategies typical of the scientific methodology. Students will develop skills in interpreting electronic schematics and handling laboratory instruments used in assembling printed circuit boards.

If health conditions prevent in-person teaching and/or evaluation, a remote learning mode will be activated, and students will be promptly informed.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	45			15					
Horas de Actividad No Presencial del Alumno/a	67,5			22,5					

Legend:
M: Lecture-based | S: Seminar | GA: Applied classroom-based groups
GL: Applied laboratory-based groups | GO: Applied computer-based groups | GCL: Applied clinical-based groups
TA: Workshop | TI: Industrial workshop | GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Multiple choice test 50%
- Oral defence 20%
- Individual assignments 30%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

CONTINUOUS ASSESSMENT (THEORY):
- There will be 5 quizzes corresponding to the first topics, which will count towards the final grade. The average of these quizzes equals 50% of the final grade for the subject. It will not be necessary to pass all of them, but a grade higher than 5/10 is required.
- Practical assignments are mandatory. A check of the necessary previous work will be conducted before each practical session, where students must attend with a compilable version of the source code. Demonstrating the correct functionality of the assignments accounts for 10% of the final grade, and a minimum grade of 4/10 is required.
- Each student will develop an individual final project, starting from week number 11. The correct functioning and performance of the program, as well as the source code used, will be evaluated and correspond to 20% of the final grade, requiring a minimum grade of 5/10. Additionally, students will undergo an oral examination where they will defend the proper functioning of their project, explain how they programmed it, and answer questions from the faculty. This evaluation equals 20% of the final grade, and a grade higher than 5/10 is necessary.

To pass the subject, it will be necessary to exceed each of the minimum grades indicated above. Failure to do so will result in the lowest grade not meeting the minimum requirement being recorded in GAUR.

In the continuous evaluation mode, students who do not complete the continuous evaluation or do not submit the final project will be graded as NOT PRESENTED.

FINAL EVALUATION
Students who do not participate in continuous assessment will take an exam graded with 50% of the final grade for the course. This exam will contain questions to assess the competencies that should be acquired in the theoretical classes and laboratories.

If a student has not attended or passed the laboratory practices, the evaluation of that part will be altered by changing the items to be evaluated. The performance of the practices will not be evaluated, and the weight of the final project will be equivalent to 30% of the final grade, requiring a minimum grade of 5/10. In either case, students must also complete the oral exam equivalent to 20% of the final grade.

To pass the course, it will be necessary to pass each of the minimum grades indicated above. Failure to do so will result in the lowest grade not meeting the minimum requirement being recorded in GAUR.

Non-attendance at the theory exam or non-submission of the final project will be graded as NOT PRESENTED.

If health conditions prevent the conduct of face-to-face teaching activities and/or assessment, a non-presential modality will be activated, of which students will be promptly informed.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Students will have the opportunity to choose whether to maintain the grades obtained during continuous assessment or not, but only for those parts that meet the minimum grade.
- Theory exam (50%) -> 5/10
- Final project (30%) -> 5/10
- Oral exam (20%) -> 5/10

However, they may choose to waive any part they have passed and undergo the evaluation process for each part again if they deem it appropriate.

For the assessment in the extraordinary session, the same assignments assigned in the ordinary session may be submitted, following the same criteria as in it. And those students who would have preferred the final evaluation in the ordinary session will be evaluated in the same way in the extraordinary session.

MANDATORY MATERIALS

Slides/documents of the subject available on eGela. Development boards for microcontrollers. Personal computer and various software required for the development of systems based on microcontrollers.

BIBLIOGRAPHY

Basic bibliography

[01] Microcontroladores MCS-51. Apuntes de clase de Ángel Mª Aledo Amorós
[02] Prácticas Básicas con microcontroladores. Apuntes de José Miguel Gil-García

Detailed bibliography

- Microcontroladores MCS-51 y MCS-251. J. Matas y R.R. Ramos. Edicions UPC. 2001
- C and the 8051 Vol.I y II. Thomas W.Schultz

Journals

r

Web sites of interest

In every chapter of [02] interesting URLs will be provided
www.embedded.com
www.8052.com

OBSERVATIONS

Only non-programmable scientific calculators may be used in assessment tests. If a programmable calculator is detected, it will be confiscated, and the use of any other device, even if it meets the established requirements, will not be allowed.

If copying is detected, the protocol on academic ethics published by the University of the Basque Country will be followed.

Universidad del País Vasco — Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty 163 - Faculty of Engineering - Vitoria-Gasteiz **Cycle** .

Degree GIEIAU10 - Bachelor's Degree in Industrial Electronics and Automation Engine **Year** Third year

COURSE

25999 - Industrial Information Technology **Credits, ECTS:** 6

COURSE DESCRIPTION

SHORT DESCRIPTION
This subject focuses on the use and application of computers in industrial environments. For it, the problem of applying computers and other intelligent devices in control applications is studied, making special emphasis on operating systems and communications. In addition, basic embedded systems concepts are introduced as well as industrial communications. These contents constitute the core of what is currently called INDUSTRY 4.0.

PREREQUISITES
This subject is based on knowledge acquired in previous subjects, therefore, it is highly recommended having previously passed them.
Most related previous subjects:
* Computer science fundamentals (1st course)
* Automation and control (2nd course)
In addition, knowledge acquired in basic subjects of Mathematics, Physics and Basic Electronics will be applied.

MAIN RELATED SUBJECTS
a) COMPULSORY SUBJECTS (3rd year):
* Automatic regulation
* Digital electronic systems
* Robotics
* Industrial automation
b) OPTIONAL SUBJECTS (4th Year):
* Embedded Systems
* Extended Industrial Information Technology
* Computer control

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

SPECIFIC COMPETENCES
1. Learn programming languages and development tools.
2. Design and implement computer-based control systems.
3. Create applications that execute the cycle: (a)Measurement, (b)Computation, (c)Actuation
4. Divide a complex problem into simpler ones
5. Design basic modules and integrate them to build complex solutions
6. Use of communications between computers (Distributed Applications)
7. Understand technical documentation (Sensors, Actuators, Communications)
8. Understand and write technical documentation related to software applications (Specifications and software documentation)

GENERIC SKILLS
9. Promote autonomous learning of new methods and theories, and the ability to adapt to new work situations.
10. Ability to solve problems with initiative, make decisions, provide creative solutions, apply critical reasoning, communicating and transmitting knowledge, skills and abilities.
11. Ability to carry out measurements, calculations, valuations, appraisals, appraisals, studies, reports, work plans and similar works.

TRANSVERSAL COMPETENCES
12. Work in multilingual and multidisciplinary environments.
13. Adopt responsible and orderly attitudes at work.
14. Apply strategies typical of scientific methodology: (a) Analyze the situation in both qualitative and quantitative way. (b) Pose hypotheses and solutions using the models specific to the engineering branch in industrial and automatic electronics.
15. Work effectively in groups integrating skills and knowledge.
16. Learn autonomously in a rapidly changing discipline (industrial computing).

Theoretical and Practical Contents

TOPIC 1. INTRODUCTION: Specific problems of control applications. Role of the computer in the control of different types of industrial systems. Comparison of centralized control vs. distributed control.

TOPIC 2. OPERATING SYSTEMS: Main functions of operating systems. Types of operating systems. Components of an operating system. Role of the Kernel. Task scheduler.

TOPIC 3. ADVANCED PROGRAMMING IN C: Variables. Flow control instructions. Features. Complex structures of data. Calls to library functions. Use of the operating system API. Decomposition of a complex problem into functions (top-down design). Unit tests. Building complex software from simpler components (bottom-up design).

TOPIC 4. EMBEDDED SYSTEMS: Introduction to concurrent programming. Programming problems in embedded systems. Execution cycle of embedded systems: (a) Data acquisition, (b) Algorithm execution control and (c) Performance.

TOPIC 5: COMMUNICATIONS BETWEEN COMPUTERS: Structuring of communications in layers. Description of the ISO OSI reference model. Description of the TCP/IP protocol stack.

TOPIC 6: INTRODUCTION TO INDUSTRIAL COMMUNICATIONS: Specific communication problems of data in industrial environments. Automation pyramid. Fieldbuses. Common networks in industrial environments.

LABORATORY: IoT APPLICATION TO ANALYZE SUSTAINABILITY IN THE EIVG: An IoT project will be developed that allows measuring and analyzing the environmental variables related to thermal comfort in the School of Engineering of Vitoria-Gasteiz within the framework of the i3KD Laborategia project (i3KD22-11).

NOTE
These topics will be developed both in the classroom through master classes and collaborative activities and in the aboratory through the execution of the project and the proposed practices (See TEACHING METHODS).

TEACHING METHODS

METHODOLOGY USED
During the development of the subject, different methodologies will be combined, which will include:

a) THEORY CLASSROOM
1. In-person theory classses
2. Collaborative activities in the classroom related to the syllabus.
3. Activities related to the proposed project.

b) LABORATORY
4. In the laboratory the Project Based Learning (PBL) methodology will be used: It will be proposed to students a project related to the subject syllabus that they must solve working in groups.
5. During the execution of the project, a set of deliverables will be required that must be delivered on time.
6. Activities related to the proposed project will be carried out in the classroom.

NOTE
In the event that health conditions do not allow it, the teaching will be adapted to be taught online according to the conditions described in eGela.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	30			30					
Horas de Actividad No Presencial del Alumno/a	45			45					

Legend:
M: Lecture-based — S: Seminar — GA: Applied classroom-based groups
GL: Applied laboratory-based groups — GO: Applied computer-based groups — GCL: Applied clinical-based groups
TA: Workshop — TI: Industrial workshop — GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 50%
- Exercises, cases or problem sets 50%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

EVALUATION DETAILS

A. CONTINUOUS EVALUATION
1. INDIVIDUAL EXAMS: (50%)
C programming exam (eliminatory): 25%
Final exam (eliminatory): 25%
2. DEVELOPMENT OF THE PROPOSED PROJECT (50%)
Evaluation of the requested reports (some activities can be carried out in the classroom): 15%
Deliverables (duly commented code, technical documentation, etc.) of the proposed project: 35%

NOTES FOR CONTINUOUS EVALUATION
1. It is mandatory to carry out the project proposed by the teaching staff to pass the subject.
2. It is mandatory to attend successfully at least 80% of the laboratory sessions to achieve a continuous assessment.
3. The completion of the project requires the timely delivery of the requested deliverables within the deadlines indicated in eGela.
4. In the middle of the course there will be an individual programming exam that will be eliminatory to continue with the project development.
5. The evaluation tests will be carried out in person. In the event that the sanitary conditions do not allow it, the evaluation tests to be carried out according to the conditions described in eGela.

B. FINAL EVALUATION
In accordance with the regulations governing student evaluation in official undergraduate degrees established at the UPV/EHU, the continuous evaluation system is the one that should preferably be used at the UPV/EHU.

The final evaluation consists of the following parts: (1) written theoretical exam, (2) C programming exam and (3) the carrying out a project proposed by the teaching staff that must be delivered in advance of the exam date.
The evaluation tests will be carried out in person. In the event that sanitary conditions do not allow it the evaluation tests will be carried out according to the conditions described in eGela.

C. RESIGNATION PROCEDURE
The resignation from continuous evaluation must be presented in writing within a period of 9 weeks from the beginning of the quarter.
D. RATING
The final grade, published in the minutes, will be:
1. If passed, the weighting of all parts of the subject: (1) C programming exam (25%); (2) Final theory exam (25%) and (3) The proposed project in the laboratory (50%).
2. If any of the parts are not passed, the grade will be the minimum grade of the parts evaluated.
3. If you do not take the final exam, a grade of NOT PRESENTED will be assigned.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

According to the Regulations governing Student Evaluation in official Degree, chapter II, article 9, section 2, this type of evaluation will be carried out exclusively through the final evaluation system. The system of final evaluation contemplates the possibility of evaluating the learning results through a test, consisting of one or more exams and global evaluation activities of the subject, which will be carried out during the official period of exams.
The evaluation tests will be carried out in person. In the event that sanitary conditions do not allow it the evaluation tests will be carried out according to the conditions described in eGela.

MANDATORY MATERIALS

MATERIALS PROVIDED WITH EGELA
1. Presentation of the subject
2. Transparencies of all the material presented in the classroom related to the syllabus (Based on the electronic book "Embedded systems and industrial communications" ISBN: 978-84-693-3714-1,
3. Materials for autonomous learning of the C language. (Electronic exercise book "Computer Science Laboratory Industrial", ISBN: 978-84-693-3715-8
4. Guidelines for project development
5. Help materials for carrying out the project.

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KERNIGHAN, BRIAN; RITCHIE, DENNIS. 1991. El Lenguaje de Programación C. (Prentice Hall)

MARQUEZ F. M. 2004, Unix Programación avanzada, 3ª Ed, (Ra-Ma)

CASTRO, M. y otros. 2007 Comunicaciones Industriales: Principios Básicos. Ed. UNED

TANENBAUM, A.S. 2004. Redes de Computadoras. (Prentice Hall)

Detailed bibliography

BURNS, A. y WELLINGS, A. 2003 Sistemas de tiempo real y Lenguajes de Programación, Ed. Addison-Wesley Iberoamericana, 3ª Ed.

ASHENDEN, PETER J. 2008. The designer's guide to VHDL.

CASTRO, M. y otros 2007 Comunicaciones Industriales: Sistemas Distribuidos y Aplicaciones. Ed. UNED,

Journals

Revista Iberoamericana de Automática e Informática Industrial (http://riai.isa.upv.es/)
IEEE Transactions on Industrial Informatics
Computers in Industry
Control Engineering

Web sites of interest

www.ehu.es
http://en.wikipedia.org/wiki/Intel_8086 (i8086)
http://en.wikipedia.org/wiki/Ada_(programming_language) (Ada)
http://en.wikipedia.org/wiki/VHDL (VHDL)
http://es.wikipedia.org/wiki/Modelo_OSI (Comunicaciones)

OBSERVATIONS

COURSE GUIDE 2024/25

Faculty 163 - Faculty of Engineering - Vitoria-Gasteiz **Cycle** .

Degree GIMADE10 - Doble Grado en Ingeniería Mecánica y en Administración y Direc **Year** Fifth year

COURSE

25988 - Environmental Technologies **Credits, ECTS:** 6

COURSE DESCRIPTION

The objective of the course "Environmental Technologies" is to acquire the basic concepts of environmental pollution and solutions to pollution in the biosphere in the three main natural resources, that are, air, water and soil. This subject shall permit a sufficient knowledge to develop your professional activity in the Engineering field in various sectors of industry.

The subject has no prerequisites. However, due to its characteristics, it is convenient that the matriculated students have already coursed "Chemical Basics of Engineering" imparted in the first course.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

SPECIFIC SKILLS
S.S.1. Know the concepts of environmental pollution and sustainability..
S.S.2. Identify, state and understand the global problems of water, air and waste, as well as their influence on the environment.
S.S.3. Applications of environmental pollution concepts and prevention and control technologies to air, water, and soil pollution problems as well as to environmental quality.
S.S.4. Ability to solve problems in the industrial technology field with initiative, decisión-making, creativity, using critical reasoning and being able to communicate and transmit the knowledge, skills and abilities acquired.
S.S.5. Know and understand how to apply the legislation related to the environment.
S.S.6. Analyze and anticipate the most important risks associated with the chemical industry (and related industries).
TRANSVERSAL SKILLS
T.S.1. Work in multidisciplinary environments.
T.S.2. Ability to collect, understand and interpret information related to environmental technologies in a scientific and technical mode and using appropriately the main bibliographic sources.
T.S.3. Responsible and orderly attitude at work and predisposition to learning.

Theoretical and Practical Contents

TOPIC 1. INTRODUCTION: THE ENVIRONMENT AND POLLUTION
TOPIC 2. ATMOSPHERIC POLLUTION (AIR)
2.1. Atmosphere. Composition and structure
2.2. Energy balance of the atmosphere
2.3. Air pollution process
2.4. Air pollutants
2.5. Air quality
2.6. Effects of air pollution
2.7. Techniques for reducing and controlling air industrial emissions
TOPIC 3. WATER POLLUTION
3.1. Nature and properties of water
3.2. Origin of water contamination
3.3. Water pollutants and effects
3.4. Surface water quality
3.5. Water and wastewater treatments.
TOPIC 4. SOIL POLLUTION AND URBAN WASTE
4.1. Soil properties and pollutants
4.2. Waste
4.3. Soil decontamination techniques

TEACHING METHODS

The methodology proposed for this subject is an active methodology that implies that the scheduled activities allow students to participate in the construction of their knowledge and acquire more responsibility.
The communication and relationship between teachers and students is carried out through the following ways:
· Lectures and classroom practices.
· Use of eGela. In this platform the students have at their disposal all the necessary information and the news are posted in eGela. Throughout the course and depending on the proposed work, forums will be opened for the exchange of information.
· Tutorials

Except for the tests and the written examination, the activities developed by the students are part of the cooperative work, in which the students work in groups.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	45		15						
Horas de Actividad No Presencial del Alumno/a	67,5		22,5						

Legend:
M: Lecture-based
S: Seminar
GA: Applied classroom-based groups
GL: Applied laboratory-based groups
GO: Applied computer-based groups
GCL: Applied clinical-based groups
TA: Workshop
TI: Industrial workshop
GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 70%
- Multiple choice test 15%
- Teamwork assignments (problem solving, Project design) 15%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

MIXED EVALUATION

The evaluation will consist of the following activities:

a) Written examination (70 % of the final mark)
b) Multiple choice tests (15 % of the final mark)
c) Group Works (15 % of the final mark)

The final mark is obtained by applying these percentages to the results of the evaluation in each of the concepts indicated above, taking into account the following REQUIREMENTS:

i) Carry out all the established activities within the set deadline.
ii) Obtain a minimum score of 3.5/10 in each of the global evaluation activities.
iii) A final mark of 5.0/10.

Whether any requirement is not met, the subject will be suspended in the ordinary examination with a final mark of 4.0, regardless the results obtained in the activities.

EVALUATION INSTRUMENTS

The evaluation instrument for each activity is a rubric or evaluation matrix, which will detail the criteria and indicators used to evaluate the achievement of the competencies. All evaluation instruments are published in eGela.

The multiple-choice tests, which will be performed via eGela or in class, positive answers will add 1 point and negative answers will reduce 0.25 points. Group work will be evaluated by the teacher by means of a rubric.

FINAL EVALUATION

Students who do not opt for the MIXED evaluation system described above will take a final exam that will include theoretical questions and problems. In order to pass the subject it will be necessary to obtain a minimum mark of 5.0/10 in this exam.

Apply for the final evaluation system:

If the student does not wish to participate in the continuous evaluation system, he/she must submit to the teacher the resignation of the continuous evaluation, for which he/she will have a period of 9 weeks, counting from the beginning of the four-month period, in accordance with the academic calendar of the center (Article 8.3 Regulations governing the evaluation of students in official undergraduate degrees, UPV/EHU). Applications will not be accepted by other ways, nor after the deadline.

RESIGNATION OF THE EVALUATION CONVOCATION

In the case of continuous evaluation, students may resign the call for assessment within a period that, at least, will be up to one month before the end of the teaching period of the subject. This resignation must be submitted in writing addressed to the teacher responsible of the subject. Resignations will not be accepted by other ways, nor after the deadline. However, in the case of a final evaluation, non-presentation of the previously established individual exams will imply the automatic resignation of the corresponding call (Article 12 Regulations governing the evaluation of students in official undergraduate degrees, UPV/EHU).

In the event that it is not possible to carry out a presential evaluation of the subject, the pertinent changes will be made for the realization of an online evaluation through the use of the existing computer tools in the UPV/EHU.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

In the extraordinary call, the evaluation process of the students is the same, being in both cases a final exam.
The final exam will consist of theoretical-questions and problems about the contents of the subject. In order to pass the subject, the minimum mark in this test will be 5/10.
The RESIGNATION procedure for the extraordinary call for evaluation of the students consists of NOT presenting to the final exam.

MANDATORY MATERIALS

Contents of the subject matter are provided by the professor through eGela.

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Ingeniería del Agua

Tecnología del Agua

Química Industrial

Biomass and Bioenergy

Enviromental Engineering Science

Web sites of interest

Legislación UE

http://europa.eu/pol/env/index_es.htm

Ministerio de Agricultura, Alimentación y Medio Ambiente: Prevención y Gestión de Residuos
http://www.magrama.gob.es/es/calidad-y-evaluacion-ambiental/temas/prevencion-y-gestion-residuos/default.aspx

Gobierno Vasco: Medio ambiente
http://www.ingurumena.ejgv.euskadi.net/r49-home/es

IHOBE: Sociedad pública vasca de medio ambiente
http://www.ihobe.net/

Instituto Nacional de Seguridad e higiene. Ministerio de Empleo y Seguridad Social
http://www.insht.es/portal/site/Insht/

European Environment Agency EEA. Spatial analysis of green infrastructure in Europea
http://www.eea.europa.eu/publications/spatial-analysis-of-green-infrastructure

OBSERVATIONS

Universidad del País Vasco Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty 163 - Faculty of Engineering - Vitoria-Gasteiz **Cycle** .

Degree GIMADE10 - Doble Grado en Ingeniería Mecánica y en Administración y Direc **Year** Fourth year

COURSE

26045 - Elasticity and Strength of Materials **Credits, ECTS:** 9

COURSE DESCRIPTION

- The elasticity and strength of materials is the science that studies the behavior of the deformable solid. Mechanics provides tools to understand the movement of bodies, and is composed of very diverse fields. One way to classify these fields is the condition of body or particle. The Physics subject of the first year studies the mechanics of the particle, considering it a point in space that has mass. When studying solids, two types are distinguished: rigid solid and deformable solid. A rigid solid will be assumed when studying velocities and accelerations since it is not necessary to study the change of shape of the body. In the second year course Applied Mechanics the rigid body is studied.
In this subject, however, it will be considered that the solids are deformable and in this case the movement has no significance. In fact, the mechanical systems studied will be in equilibrium.
The theory of elasticity studies elastic bodies, formulating mathematically the relationship between external actions and the body's response. The strength of materials, studies the most common elements of structures. These elements have a simple geometry, and allow the use of simplifying hypotheses that speed up the calculation. The results are not as accurate as those of the elasticity theory, but the error can be considered negligible.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

The behavior of real (deformable) solids is introduced in this course. After an exposition of the fundamental concepts of the Theory of Elasticity, the program focuses on the analysis and design of prismatic piece-type structural elements, subjected to different section stresses. It starts with axial stress. Next, the stresses and deformations originated both in pure bending and in simple bending are studied, and their application is carried out for the resolution of isostatic structures.
- The subject provides knowledge that is at the base of the analysis and design methods of any Mechanical Engineering work.
- Specific Technology Module Competence, Mechanics:
- Knowledge and skills to apply the fundamentals of elasticity and resistance of materials to the behavior of real solids.
- Learning outcomes:
- Know, understand and apply the fundamentals of elasticity and resistance of materials to the behavior of real solids that enable the student for the subsequent application of advanced methods and theories in their professional development in areas of mechanical engineering and also provide them with a great versatility to adapt to new situations.
- Properly apply the strategies of scientific methodology to the problems posed by structural systems and the deformable solid: analyze the situation qualitatively and quantitatively, propose hypotheses and solutions to solve problems inherent to mechanical engineering.
- Express, using the appropriate means, the theoretical knowledge, resolution methods, results and aspects inherent to the problems posed by the equilibrium of the deformable solid and structural systems, using specific vocabulary and terminology.
- Work effectively in a group integrating skills and knowledge to formulate ideas, debate proposals and make decisions in the development of own work, the elasticity and resistance of materials.
- Carry out measurements, calculations, studies, reports and other similar work related to problematic situations that may arise in the field of elasticity and resistance of materials.

Theoretical and Practical Contents

The elastic solid: stresses, deformations and compatibility equations.
- Tensionn and compression.
- Shear strength
- Flexure theory: pure, simple, compound, isostatic and hyperstatic.
- Torsion.
- Internal potential. Energy theorems

TEACHING METHODS

In the theoretical classes the theory will be explained and related examples will be solved.
Some topics will be worked on with the flipped classroom methodology, and material will be made available to the students to work on the theory at home, and doubts will be answered in class and exercises to apply the theory will be carried out.

In classroom practices, theoretical concepts can be explained and exercises to be developed proposed.

In class, the teacher will propose some work, which can be problems, practices or exercises to work on theory.
All these works will be evaluated and will account for 20% of the final grade.

During the semester, there will be a partial exam, which, if approved, will release material for the final exam.

To pass the exams, whether partial or final, you must obtain a minimum score of 3 out of 10 in each section of the same. Therefore, the final grade will be calculated as follows: 0.4 x partial exam grade + 0.4 final exam grade + 0.2 individual work grade.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	45		30	15					
Horas de Actividad No Presencial del Alumno/a	67,5		45	22,5					

Legend:
M: Lecture-based
S: Seminar
GA: Applied classroom-based groups
GL: Applied laboratory-based groups
GO: Applied computer-based groups
GCL: Applied clinical-based groups
TA: Workshop
TI: Industrial workshop
GCA: Applied fieldwork groups

Evaluation methods

- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 80%
- Individual assignments 20%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The written tests to be developed are detailed below:
A midterm exam will be held. The final exams will be attended with pending material.
The final mark of the exams will be the average of the two parts.
The deliverables to be carried out will consist of different tasks that will be described throughout the course, including the laboratory practices. Some should be done individually, others in groups. Some of them will be face-to-face and will take place in class.
In the event that presential evaluation of the subject cannot be carried out, the pertinent changes will be made to carry out an on-line evaluation by using the IT tools available at the UPV / EHU. The characteristics of this online assessment will be published in the student guides and in eGela

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

idem

MANDATORY MATERIALS

Teachers notes.
Material available in egela

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Basic bibliography

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Detailed bibliography

Manuel Vazquez. Resistencia de Materiales. Editorial: Universidad Politécnica de Madrid
Luis Ortiz Berrocal. Resistencia de Materiales. Editorial Mc Graw Hill
Timoshenko. Resistencia de Materiales (2 tomos). Editorial: Espasa-Calpe

Journals

Web sites of interest

http://egela.ehu.eus

OBSERVATIONS

Universidad del País Vasco — Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty 163 - Faculty of Engineering - Vitoria-Gasteiz **Cycle** .

Degree GIIGSI10 - Bachelor's Degree in Computer Engineering in Management and In **Year** Fourth year

COURSE

26006 - Extended Industrial Information Technology **Credits, ECTS:** 6

COURSE DESCRIPTION

The 4th year optional subject ‘Extension of Industrial Computing’ is a subject that can be taken from two degrees:
-Degree in Computer Engineering in Management and Information Systems
-Degree in Industrial Electronics and Automation Engineering.

Therefore, it is assumed that the students' skills and knowledge at the beginning of the course are very different.

In any case, it is advisable to have programming knowledge, either in PC platforms or other more specific ones.

Given its terminal nature, the aim is to offer a practical vision that is as up-to-date as possible in accordance with the latest trends in the sector, without losing rigour in the treatment of the contents.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

- TEEOI10 - Applied knowledge of industrial computing and communications.

The transversal competences of the module with which there is an identification on the part of the subject are:
- C10 - Ability to work in a multilingual and multidisciplinary environment.
- C13 - Apply the strategies of the scientific methodology: analyze the situation and problems qualitatively and quantitatively. Raise hypotheses and solutions using engineering models.

In addition to those mentioned:
- The student is able to write reports at the level corresponding to the course
- Capacity for innovation and creativity
- Autonomous Learning

Theoretical and Practical Contents

T1. Introduction to Industry 4.0
T2. Infrastructure
T3. Applications
T4. Artificial Intelligence
T5. High-level elements

TEACHING METHODS

The teaching methodology is based on cooperative learning, using mainly group work and autonomous learning.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	30			30					
Horas de Actividad No Presencial del Alumno/a	45			45					

Legend:
M: Lecture-based — S: Seminar — GA: Applied classroom-based groups
GL: Applied laboratory-based groups — GO: Applied computer-based groups — GCL: Applied clinical-based groups
TA: Workshop — TI: Industrial workshop — GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 20%
- Exercises, cases or problem sets 40%
- Teamwork assignments (problem solving, Project design) 40%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Own Theoretical Work: 40% -Practical Work: 40%.
-Practical work: 40%.

Tests on other theoretical and/or practical work: 20% -Tests on other theoretical and/or practical work: 20%.
-Modification according to oral presentation: up to +-10%.
Modification according to cross-evaluations within the working groups: up to +-10% -Modification according to cross-evaluations within the working groups: up to +-10%.

According to the Regulations governing student assessment in official undergraduate degrees, chapter II, article 8, section 3, all students will have the right to be assessed by the final assessment system, regardless of whether or not they have participated in the continuous assessment system. To do so, students must submit a written waiver of continuous assessment to the lecturer responsible for the subject, for which they will have a period of 9 weeks from the beginning of the term, in accordance with the academic calendar of the centre.

If a student wishes to waive the exams, he/she may do so by writing to the subject's teaching staff before the start date of the exams or by not taking the final exam, if there is one.

If there is a written final exam, a minimum grade of 4/10 must be obtained in order to pass the course.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

According to the Regulations governing student assessment in official undergraduate degrees, Chapter II, Article 9, section 2, this type of assessment will be carried out exclusively through the final assessment system. Likewise, according to section 3 of the aforementioned article, this test may consist of as many examinations and assessment activities as necessary.

If appropriate, the results obtained in the continuous assessment part of the Ordinary Examination may be maintained.

‘In the event that it is not possible to carry out a face-to-face assessment of the subject, for reasons associated with the health situation, the assessment will be adapted to the current situation’.

MANDATORY MATERIALS

Given the high technological component of the subject and the great dynamism of these technologies, the teaching team of the subject will indicate at the beginning of the course the compulsory material to be used in the course (if any).

BIBLIOGRAPHY

Basic bibliography

Due to the great dynamism of the contents of the subject, there is no basic material established for it. At the beginning of the course, students will be offered a set of updated bibliographical references.

Detailed bibliography

Due to the great dynamism of the contents of the subject, there is no established in-depth material on the subject. At the beginning of the course, students will be offered a set of updated bibliographical references.

Journals

Due to the great dynamism of the contents of the subject, there is no established set of reference journals for the subject. At the beginning of the course, students will be offered an updated set of journals.

Web sites of interest

Due to the great dynamism of the contents of the subject, there is no established set of Internet addresses for the subject. At the beginning of the course, students will be provided with an updated set of bibliographical references.

OBSERVATIONS

Universidad del País Vasco — Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty	163 - Faculty of Engineering - Vitoria-Gasteiz	**Cycle**	.
Degree	GIIGSI10 - Bachelor's Degree in Computer Engineering in Management and In	**Year**	Second year

COURSE

26016 - Structures of Data and Algorithms — **Credits, ECTS:** 6

COURSE DESCRIPTION

The subject of Data Structures and Algorithms presents the students with the importance of organizing the data and using the appropriate algorithms for the development and maintenance of the software.

This subject introduces, analyzes and compares the main data structures and known algorithms used in solving real problems. The purpose of the subject is for students to learn: 1) theoretical and practical knowledge about the organization of data and the basic operations about them; and 2) the implications that these have on the efficiency of programs; so that they are able to properly design and organize applications that allow solving real problems.

In the degree, the subject of Data Structures and Algorithms is mainly based on the concepts acquired in the subjects of Basic Programming and Modular Programming and Object Orientation (PMyOO), both studied in the first course. Together with the subjects of Programming Methodology and PMyOO, both courses in the first course, they form the Programming submodule for student training in the design and implementation of computer management applications. This training, at the same time, is the fundamental basis for the subjects: (1) Databases, (2) Software Engineering and (3) Languages, Computing and Intelligent Systems, which will be studied in the second four-month period of the same course and complementary to the subjects of the submodule of Design and Administration of Information Systems (third course): (4) Analysis and Design of Information Systems.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

This subject develops the following competencies of the module common to the field of Informatics:

- M02CM01. Ability to design, develop, select and evaluate applications and computer systems, ensuring their reliability, safety and quality, in accordance with ethical principles and current legislation and regulations.
- M02CM06. Knowledge and application of basic algorithmic procedures of computer technologies to design problem solutions, analyzing the suitability and complexity of the proposed algorithms
- M02CM07. Knowledge, design and efficient use of data types and structures most suited to solving a problem
- M02CM08.Capacidad to analyze, design, build and maintain applications in a robust, safe and efficient way, choosing the most appropriate programming language and paradigm.

The following describes the specific competencies of the subject:
C1. Ability to analyze the efficiency of the algorithms designed.
C2. Knowledge and ability to design and implement the main data structures: lists, piles, tails, trees, graphs and hash tables;
C3. Ability to design and use recursive design on linear and non-linear data structures.
C4. Ability to analyze and use the main algorithms of search, ordering and travel in different data structures.
C5. Ability to select, design and implement new efficient data structures for problem solving.

Alongside the previous competences, cross-cutting teamwork competency will also be addressed.

Theoretical and Practical Contents

Topic 1: Algorithm analysis. The cost function. Command functions. Analysis of ordering and search algorithms. Practical exercises.
Topic 2: Linear Data Structures: Lists, Stacks and Tails. Examples of applications with such structures. Efficiency analysis.
Theme 3: Recursive algorithm design Recursive design methodology. Implementation of recursive programs. Practical examples and exercises.
Item 4: Trees. Binary Trees. Binary search trees. Trees B,B+ and B*. Analysis of algorithm efficiency on trees: searches and tours.
Item 5: Graphs. Representation and algorithms of graph paths.
Topic 6: Hash tables. Hash function. Analysis of the efficiency of hash tables. Open and closed tables.
Topic 7: Structures in external memory Organization of files and access methods.
Topic 8: Analysis, Design and Implementation of solutions to solve a problem Design of data structures. Analysis of data structures. Implementation of data structures and methods

TEACHING METHODS

The subjects of the course will be exposed in class and corresponding reading material from the textbook or material expressly determined for that purpose will be indicated. In class sessions, exhibitions of subjects, problem solving and

discussions of design alternatives will be systematically held in order to promote direct participation and encourage students' motivation. Generally, collaborative work for a common end will be enhanced.

A set of exercises published in advance in eGela will be implemented in computer laboratories. The meetings require preparatory work on these exercises and the drafting of a report justifying their interpretation.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	45			15					
Horas de Actividad No Presencial del Alumno/a	67,5			22,5					

Legend:
M: Lecture-based — S: Seminar — GA: Applied classroom-based groups
GL: Applied laboratory-based groups — GO: Applied computer-based groups — GCL: Applied clinical-based groups
TA: Workshop — TI: Industrial workshop — GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 60%
- Exercises, cases or problem sets 20%
- Teamwork assignments (problem solving, Project design) 20%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The assessment of the subject in the ORDINARIA call is performed through continuous evaluation or final evaluation. By default, all students will undergo continuous evaluation unless they give up.

* EVALUATION BY FINAL EVALUATION
The student or student may decide to waive the continuous evaluation to perform the final evaluation. This waiver should be submitted in writing to the faculty responsible for the subject within the time limits stipulated in Article 8 of the regulations on the evaluation of students. Exceptional cases shall not be accepted and continuous assessment shall not be waived after the dates allowed.

To pass the subject, the student must obtain a minimum score of 5 points out of 10.

* CONTINUOUS EVALUATION (by default)
The default evaluation of the subject will be done through CONTINUOUS evaluation, except for those students who have expressly waived it in the established period.

The final note of the subject is calculated based on the notes of the tests to be carried out during the four-month period, as well as the reports of laboratories and group project to be carried out throughout the course. The exams individually assess the theoretical and practical knowledge acquired during the course.

Being 100% the maximum grade of the subject, the weights of the different parts in the final note are:
* Exams (individual): 60% of the subject note. It shall be carried out through:
- First part: 10% of the subject note
- Second part: 20% of the subject note
- Final exam: 30% of the subject note. It will consist of a written test where the student will demonstrate the concepts acquired through problem solving.
* Problem-solving reports (group): 20% of the subject note. Reports and implementations of 4 computer laboratories will be evaluated
* Project (group): 20% of the subject note

*CLASSIFICATION IN MINUTES:
The student shall be deemed to have submitted to the ORDINARIA call if he/she has carried out the continuous evaluation, i.e. has not given up the call.

In any case, to approve the subject, it is necessary to present to the exam and, in addition, to have performed the laboratories and the proposed group project.

In addition, to approve the subject it will also be necessary for each student to obtain at least:
- 40% of the grade in the weighted average of examinations
- 40% of the note in the average of all problem solving reports

- 50% of the grade in the project to be done in group.

In case of NOT obtaining the minimum qualification required in any of them, it will be considered that the student has suspended the ordinary call of the subject, obtaining as qualification the weighted average score of the individual exams.

In addition, assuming that the student gets the minimum grade in each and every part, the minimum grade that the student must obtain to approve the subject is 5 points out of the total of 10 of the subject. If a lower qualification is obtained, the student will be considered to have suspended the ordinary call for the subject.

Students who do not exceed or are not present in the ordinary call must be examined in an EXTRAORDINARY call in which they will be evaluated in a global examination of the whole subject.

* WAIVER OF THE RIGHT OF REVIEW
The student or student who has selected the final evaluation is not present in the ORDINARY call will get the final rating "NOT SUBMITTED". Students who follow the continuous evaluation may waive the call in accordance with Article 12 of the regulations on the evaluation of students.

* COPY CASES
Article 11 of the current rules on the evaluation of pupils shall apply.

Student Assessment Standards: https://www.ehu.eus/es/web/estudiosdegrado-gradukoikasketak/ebaluaziorako-arautegia

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The extraordinary call consists of a global examination of 10 points in which both theoretical knowledge and practical aspects developed during the course are evaluated.

If an in-person evaluation of the subject cannot be carried out, the pertinent changes will be made to make it online using the existing computer tools in the UPV/EHU. The characteristics of this online evaluation will be made public.

*CLASSIFICATION IN MINUTES:
To pass the subject it is necessary to obtain a minimum score of 5 points out of 10.

* WAIVER OF THE RIGHT OF REVIEW
In order to waive the right of scrutiny, it is sufficient not to be presented.

* COPY CASES
Article 11 of the current rules on the evaluation of pupils shall apply.

* EXCEPTIONAL CASE:
In the event that an in-person evaluation of the subject cannot be carried out, the pertinent changes will be made to carry out an on-line evaluation using the computer tools existing in the UPV/EHU. The characteristics of this online evaluation will be published in student guides and eGela

Student Assessment Standards: https://www.ehu.eus/es/web/estudiosdegrado-gradukoikasketak/ebaluaziorako-arautegia

MANDATORY MATERIALS

Material available on eGela platform:
1.- Material characteristic of the subject: notes, transparencies, exercise list, laboratory statements, practice statement, etc.
2.- Material that can be incorporated into the page of the subject through the content and teaching manager eGela

BIBLIOGRAPHY

Basic bibliography

- "Data Structures & Problem Solving Using Java" (4th edition). M.A. Weiss. Pearson, 2010

Detailed bibliography

- "Data Structures in Java". M.A. Weiss. Addison-Wesley, 2000
- "Data Structures in Java". Luis Joyanes, Ignacio Zahonero. McGraw-Hill, 2007
- "Data structures with Java: Design of structures and algorithms" (second edition). John Lewis and Joseph Chase. Addison Wesley (2006).
- "A practical guide to data structures and algorithms using Java". Sally Goldman and Kenneth Goldman. Chapman & Hall/CRC (2008).
- "Data structure and algorithms." Alfred. V. Aho, John. E. Hopcroft, Jeffrey. D. Ullman. Addison-Wesley (1988)
- "Java Generics and Collections". M. Naftalin and P. Wadler. O'Reilly

Journals

Web sites of interest

- JavaTM 2 Platform, Standard Edition, v 1.4.2 API Specification: http://download.oracle.com/javase/1.4.2/docs/api/
- Dictionary of Algorithms and Data Structures: http://xlinux.nist.gov/dads//
- http://www.eclipse.org/

OBSERVATIONS

Universidad del País Vasco — Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty 163 - Faculty of Engineering - Vitoria-Gasteiz **Cycle** .

Degree GIIGSI10 - Bachelor's Degree in Computer Engineering in Management and In **Year** Second year

COURSE

26017 - Software Engineering **Credits, ECTS:** 6

COURSE DESCRIPTION

The general objective of the course is to design and implement applications, the requirements of which have been previously captured. To develop software products following a systematic process, active methodologies and multi-layer software architectures will be applied, relying on tools that improve the quality of the software.

To be able to study Software Engineering without undue difficulty, it is recommended to have previously acquired the following skills:

- In the "Modular and Object Oriented Programming" subject:
 * Know and understand the fundamentals of the Object Orientation paradigm and the corresponding elements in an Object Oriented programming language
 * Understand the difference between classes and objects; the relationship between classes, inheritance and polymorphism
 * Develop small programs applying all the concepts about programming acquired
 * Knowledge and use of exceptions as an error control mechanism for the correct operation of programs
- In the subject "Data Structures and Algorithms" subject:
 * Knowledge and ability to apply Abstract Data Types to problems of medium complexity: Lists, Stacks, Queues, Hash Tables, Trees and Graphs
 * Knowledge and ability to analyze the main algorithms for the treatment of data structures: Search, Sorting, and Enumeration
 * Ability to efficiently select, design and implement the best data structure for solving a problem

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

C1: Know how to distinguish the various stages that make up any software engineering process.
C2: Know how to understand an object-oriented software system in the UML language.
C3: Know how to design a software system in a multi-layer architecture based on the analysis previously conducted.
C4: Know how to implement a system based on the design of the application.

Transversal competencies:

C9b: Know how to communicate and transmit knowledge, abilities and skills of the profession of Computer Engineering

Theoretical and Practical Contents

UT1: Introduction to Software Engineering
 - Motivation and life cycle of the software
 - Objectives, properties and associated programming technologies.
UT2: Specification of UML artifacts
 - Study of the different artifacts existing in UML
UT3: Multi-layer software architectures: Presentation, Business Logic and Data
 - Design of the different layers that make up a software system
UT4: Object Oriented Design and Programming
 - Functionality design
UT5: Implementation of a specific product
 - Implementation of a software system using a set of languages and current tools

TEACHING METHODS

As it is a substantially practical subject, the MASTER classes (M) will be used for the exposition of the theoretical concepts necessary in the practical classes, as well as for the resolution of doubts raised by the students. In the same way, the concepts acquired through the resolution of exercises will be reinforced, either individually or in small groups.

The COMPUTER PRACTICES (CP) classes will be used to apply the active Project-Based Learning methodology. At the beginning of the semester, students will be provided with a project statement that realistically brings together the contents of the subject. They will carry out this project in groups of 2-4 people, following the agile SCRUM methodology. This methodology proposes to develop the project in an incremental way, through successive iterations, in each of which a partial product is obtained that adds new functionality to the previous one. Each iteration is also associated with the

realization of its corresponding documentation.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	45			15					
Horas de Actividad No Presencial del Alumno/a	67,5			22,5					

Legend:
M: Lecture-based
S: Seminar
GA: Applied classroom-based groups
GL: Applied laboratory-based groups
GO: Applied computer-based groups
GCL: Applied clinical-based groups
TA: Workshop
TI: Industrial workshop
GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 60%
- Teamwork assignments (problem solving, Project design) 40%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The evaluation of the subject in the ORDINARY call will be made through continuous evaluation or final evaluation. By default, all students will take continuous assessment, unless they resign it.

* EVALUATION THROUGH FINAL EVALUATION

The student can renounce the continuous evaluation to carry out the final evaluation. This resignation must be submitted in writing to the responsible teachers within the terms stipulated in Article 8.3 of the regulations on student assessment. Exceptional cases or waivers of continuous evaluation will not be accepted after the dates enabled for it.

Students who have waived continuous assessment will undergo a test that represents 100% of the course grade in which both theoretical and practical (competences addressed in the project) aspects worked on in the subject will be evaluated. To pass, the student must obtain a minimum grade of 5 out of 10 in both parts (theoretical and practical). When a student fails the subject having passed the theoretical part or the practical part, that part will be kept for the extraordinary call.

The student can give up the continuous evaluation to carry out the final evaluation. This waiver will must submit in writing to the responsible faculty within the deadlines stipulated in Article 8.3 of the regulations about student assessment. Exceptional cases or waivers of continuous evaluation will not be accepted. after the dates enabled for it.

* CONTINUOUS ASSESSMENT

The default assessment of the subject is done through continuous assessment, unless the student has expressly waived it.

The final grade for the course is calculated based on the test scores and a project to be developed as a team. The final grade is calculated with the following weights:
- 40% based on a series of deliveries on a project (deliverables).
- 60% by taking different tests that will always include 3 exams.

In this evaluation, the student takes two exams throughout the semester.
The student must obtain at least 4 out of 10 in each of the exams, being the average at least 5 out of 10, and 5 out of 10 in the project in order to pass. Otherwise, the grade obtained will be the average of the exams (and in no case will it exceed 4 points out of 10). When a student fails the subject having passed the theoretical part (has obtained an average mark in the exams equal to or greater than 5, obtaining at least 4 points out of 10 in each of the partials) or the practical part, that part will be kept for the extraordincary call.

If it is not possible to carry out a face-to-face evaluation of the subject, the pertinent changes will be made to do it online by using the existing computer tools at the UPV / EHU. The characteristics of this online evaluation will be made public.

* WAIVER OF THE RIGHT TO EXAM

The student or the student who, having selected to take the final evaluation, does not appear for the exam in the ordinary call, will obtain the final grade "Not Presented".

The students who follow the continuous evaluation may make the waiver of the call in accordance with the provisions of Article 12 of the regulations on student evaluation.

* COPY CASES:
Article 11 of the current regulations regarding the evaluation of students will apply.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Students who have not passed the subject in the ordinary call will undergo a test that represents 100% of the the course mark in which both theoretical and practical (competences addressed in the project) aspects worked on in the subject will be evaluated. To pass, the student must obtain a minimum grade of 5 in both parts (theoretical and practical). The theoretical part will account for 60% of the final mark and the practical part 40%. Students who have passed one of the parts (theoretical or practical) in the ordinary call must only do the pending part.

To waive the right to the exam, it will be enough to not show up.

If it is not possible to carry out a face-to-face evaluation of the subject, the pertinent changes will be made to do it online by using the existing computer tools at the UPV / EHU. The characteristics of this online evaluation will be made public.

* COPY CASES:
Article 11 of the current regulations regarding the evaluation of students will apply.

MANDATORY MATERIALS

Material shared in eGela.

BIBLIOGRAPHY

Basic bibliography

Ingeniería del Software. Un enfoque práctico. Roger S. Pressman. MacGraw-Hill, 2001. 5a Edición.

Ingeniería El Proceso Unificado de Desarrollo de Software Jacobson, Booch, Rumbaugh. Editorial Addison Wesley, 1999

Design Patterns, Elements of Reusable Object-Oriented Software. Erich Gamma, Richard Helm, Ralph Johnson, John M. Vlissides, 1995

A Pattern Language: Towns, Buildings, Construction. Christopher Alexander, Sara Ishikawa, Murray Silverstein, 1977

Java 8 in Action
Lambdas, streams, and functional-style programming. Raoul-Gabriel Urma, Mario Fusco, and Alan Mycroft. Manning. 2014

Detailed bibliography

Object Oriented Software Construction. Bertrand Meyer. Prentice-Hall. 1998.

Journals

Web sites of interest

http://www.uml.org/

http://www.visual-paradigm.com/product/vpuml/

Books about design patrones:
http://hillside.net/patterns/books/
http://www.javacamp.org/designPattern/
http://www.dofactory.com/net/design-patterns

OBSERVATIONS

The concepts covered in the subjects "Modular and Object Oriented Programming" and "Data Structures and Algorithms" are required for this subject. To take this subject, you should have passed or at least completed these subjects.

Universidad del País Vasco Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty 163 - Faculty of Engineering - Vitoria-Gasteiz **Cycle** .

Degree GIIGSI10 - Bachelor's Degree in Computer Engineering in Management and In **Year** Second year

COURSE

26018 - Computer Architecture **Credits, ECTS:** 6

COURSE DESCRIPTION

The subject ‘Computer Architecture’ is a compulsory subject in the first four-month period of the 2nd year.

The subject is included in the module ‘M02-Common to the Computer Science Branch’, and more specifically in the sub-module called ‘Computer Structure and Architecture’ of 12 ECTS credits. Next to it in this sub-module is the subject ‘Computer Structure’, of 6 ECTS credits.

This subject has a terminal character (as far as the obligatory nature of the syllabus is concerned) with regard to the analysis of the internal blocks of a computer.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

The course aims to acquire the SPECIFIC COMPETENCES OF THE MODULE:

M02CM9-Ability to know, understand and evaluate the structure and architecture of computers, as well as the basic components that make them up.

M02CM14-Knowledge and application of the fundamental principles and basic techniques of parallel, concurrent, distributed and real-time programming (partial identification, only parallel programming).
parallel programming only)

These correspond to the DEGREE COMPETENCES:

G004-Ability to define, evaluate and select hardware and software platforms for the development and execution of computer systems, services and applications.

G006.- Ability to conceive and develop centralised or distributed computer systems or architectures integrating hardware, software and networks.

G009.- Ability to solve problems with initiative, decision-making, autonomy and creativity. Ability to know how to communicate and transmit the knowledge, skills and abilities of the profession of Technical Engineer in Computer Science.

These correspond to the following EQF BASIC COMPETENCES:

CB1.- That students have demonstrated to possess and understand knowledge in an area of study that starts from the basis of general secondary education, and is usually found at a level that, although it is supported by advanced textbooks, also includes some aspects that involve knowledge from the forefront of their field of study.

CB2.- Students are able to apply their knowledge to their work or vocation in a professional manner and possess the competences usually demonstrated through the development and defence of arguments and problem solving within their field of study.

CB3.- Students have the ability to gather and interpret relevant data (usually within their area of study) in order to make judgements that include reflection on relevant social, scientific or ethical issues.

CB4.- Students are able to transmit information, ideas, problems and solutions to both specialist and non-specialist audiences.

CB5.- That students have developed those learning skills necessary to undertake further studies with a high degree of autonomy.

With regard to the TRANSVERSAL COMPETENCES, since the approved regulations do not specify them, the Quality Commission of the centre drew up a document ‘Guidance for the work on the Improvement and Accreditation of the Degrees’, in which it is recommended to work on several transversal competences.
recommended to work on several transversal competences. Of these, the following are worked on at a basic level level, the following are worked on:

- Written communication

- Capacity for innovation and creativity
- Autonomous learning

Regarding the LEARNING OUTCOMES, in the degree document they are not specified for the module to which the subject belongs.

Theoretical and Practical Contents

In the theoretical part of the course, the following concepts will be dealt with:
1. Cache memory. Most important design parameters.
2. Linear Segmented Processor.
3. SIMD Instructions.
4. Introduction to Parallelism.

In the practical part of the course, small projects will be carried out with flexible programmable systems.

In this line, from the academic year 2022/23 an i3kd activity will be incorporated into the course (depending on budget availability) to encourage active learning by the students, showing that the knowledge related to specific hardware of the course has direct application in day-to-day life. This activity consists of the implementation of a CO2 meter by the students. This could be done by means of a specific lecture by teachers from outside the subject.

TEACHING METHODS

The teaching methodology is based on cooperative learning and problem-based learning (PBL), using mainly group work and autonomous learning.

Topic 1: Short presentations by the teacher and group work through cooperative learning.

Topic 2: Group work through cooperative learning.

Topic 3: Group work through cooperative learning.

Topic 4: Group work through problem-based learning (PBL).

Practical: Group work through cooperative learning.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	45			15					
Horas de Actividad No Presencial del Alumno/a	67,5			22,5					

Legend:
M: Lecture-based — S: Seminar — GA: Applied classroom-based groups
GL: Applied laboratory-based groups — GO: Applied computer-based groups — GCL: Applied clinical-based groups
TA: Workshop — TI: Industrial workshop — GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 20%
- Exercises, cases or problem sets 20%
- Teamwork assignments (problem solving, Project design) 60%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

-Theory Topics 1, 2 and 3:
Own theoretical group work: 35%.
Tests on other theoretical and/or practical work: 20%.
-Theory Topic 4: Methodology AB Problems: 25% -Practicals: 20% -Teachings: 20% -Theoretical work
Practical work: 20% -Practical work: 20% -Modification according to oral presentation within the group
-Modification according to oral presentation within each section: up to ±10%.
Modification according to cross-evaluation of peers within each section: up to ±10% -Modification according to cross-evaluation of peers within each section: up to ±10%.

According to the Regulations governing student assessment in official undergraduate degrees, chapter II, article 8, section 3, all students will have the right to be assessed using the final assessment system, regardless of whether or not they have participated in the continuous assessment system. To this end, students must submit a written waiver of continuous

assessment to the lecturer responsible for the subject, for which they will have a period of 9 weeks from the beginning of the term, in accordance with the academic calendar of the centre.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

According to the Regulations governing student assessment in official undergraduate degrees, Chapter II, Article 9, section 2, this type of assessment will be carried out exclusively through the final assessment system. Likewise, according to section 3 of the aforementioned article, this test may consist of as many exams and assessment activities as necessary.

MANDATORY MATERIALS

Given the high technological component of the subject and the great dynamism of these technologies, the teaching team of the subject will indicate at the beginning of the course the compulsory material to be used in the course (if any).

BIBLIOGRAPHY

Basic bibliography

ARQUITECTURA DE COMPUTADORES. UN ENFOQUE CUANTITATIVO.
J.L. Hennessy, D.A. Patterson. McGraw-Hill, 1993.

COMPUTER ARQUITECTURE. A QUANTITATIVE APPROACH.
J.L. Hennessy, D.A. Patterson (4. ed.) Morgan Kaufmann, 2007

ORGANIZACION DE COMPUTADORES.
V.C. Hamacher, Z.G. Vranesic y S.G. Zaky. Ed. McGraw-Hill, 2003 (5. edición).

ORGANIZACION Y ARQUITECTURA DE COMPUTADORES.
W. Stallings. Ed. Prentice-Hall, 2006 (7. edición).

Detailed bibliography

Due to the great dynamism of the contents of the subject, there is no established in-depth material on the subject. At the beginning of the course, students will be offered a set of updated bibliographical references.

Journals

Due to the great dynamism of the contents of the subject, there is no established set of reference journals for the subject. At the beginning of the course, students will be offered an updated set of journals.

Web sites of interest

Due to the great dynamism of the contents of the subject, there is no established set of reference journals for the subject. At the beginning of the course, students will be offered an updated set of journals.

OBSERVATIONS

Universidad del País Vasco — Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty 163 - Faculty of Engineering - Vitoria-Gasteiz **Cycle** .

Degree GIIGSI10 - Bachelor's Degree in Computer Engineering in Management and In **Year** Second year

COURSE

26021 - Languages, Computing & Smart Systems **Credits, ECTS:** 6

COURSE DESCRIPTION

The content of this subject course belongs to a classical branch of theoretical computer science that predates modern computers. It sets out from the theory of automata and formal languages, applied directly to the definition of programming languages and the construction of compilers.
The formalisms dealt with allow the computer/computing concept to be abstracted to analyse the computability, complexity and processability of the algorithms used in current areas like optimising algorithms and cryptography.
Algebra of sets and the formal specification/description of languages is used, so it is useful to have completed the subject course in Programming Methodology in the first year of this degree, and specification in particular.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

- Identifying and solving problems that can be approached using restricted computational (automata) or alternative (smart systems) models.
- Using regular expressions and grammars to define formal languages.
- Using pattern recognition and processing software.
- Understanding the existence of intrinsic limits to computational processes and their consequences.
- Knowing and using different programming paradigms and alternative computing models.
- Working on and analysing problems and their computational solutions by making use of verbal, mathematical and graphic language.

Theoretical and Practical Contents

- Memoryless Computing: Automata and Finite State Translators. Regular expressions and languages.
Applications: lexical analysis
- Restricted memory: Pushdown Automata. Context-Free languages and grammars. Linear Bounded Automata.
Applications: syntactical analysis (parsers).
- The General Computer Model and its Limitations: Turing Machines. Computational Universality and the Church-Turing Thesis. Incomputability. Introduction to Computational Complexity Applications: public-key cryptography.
- Alternatives to the Computing Model: Machine Models and Programming Paradigms. Real circuits and machines.
Imperative, functional and logical programs. Applications: automatic reasoning
- Alternatives to the Problem Model: Non-functional specifications. Decision trees. Classifiers. Probabilistic programming.
Applications: systems that learn.

TEACHING METHODS

Lectures (M) outline the different theoretical bases of the subject course, introducing algorithms in the form of exercises worked on in class. Further exercises are set for working on in pairs in the laboratories (PL), which are checked using automata simulators (JFLAP).

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	45			15					
Horas de Actividad No Presencial del Alumno/a	67,5			22,5					

Legend:
M: Lecture-based — S: Seminar — GA: Applied classroom-based groups
GL: Applied laboratory-based groups — GO: Applied computer-based groups — GCL: Applied clinical-based groups
TA: Workshop — TI: Industrial workshop — GCA: Applied fieldwork groups

Evaluation methods

- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 75%
- Exercises, cases or problem sets 25%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

There will be three partial examinations, each accounting for 25% of the course mark. For the ordinary session there will be an optional catch-up session for each of the three blocks to boost marks.
Laboratory work will be worth 25% of the mark, with individual testing after completion.
If continuous assessment is waived there will be a final examination worth 100 % of the mark. The lecturer must be informed of this waiver by the 9th week, in accordance with current regulations.

If the final is not attended it will be considered not sat.
If the course cannot be assessed face-to-face, the relevant changes will be made to carry it out online by using the IT tools available at the UPV/EHU. The particulars of this online assessment will be made public.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

For the ordinary session there will be a final examination worth 100 % of the mark. No mark is carried over from previous assessments.

MANDATORY MATERIALS

Course notes and JFLAP simulator.

BIBLIOGRAPHY

Basic bibliography

- Ramón F. BRENA; "Autómatas y Lenguajes. Un enfoque de diseño", Tec de Monterrey, 2003.
- Jean Gallier, "Introduction to the Theory of Computation", University of Pennsylvania, 2018.
- Elaine RICH, "Automata, Computability and Complexity. Theory and Applications", Pearson/Prentice Hall, 2008
- V. MATHIVET, "Inteligencia Artificial para desarrolladores. Conceptos e implementación en Java", ENI Ediciones, 2017
- J.E. HOPCROFT, R. MOTWANI, J.D. ULLMAN: "Teoría de Autómatas, Lenguajes y Computación" 3ª ed. Pearson educación, 2007
- S. RUSSELL, P. NORVIG: "Artificial Intelligence: A Modern Approach" 2ª ed. Prentice Hall, 2003
- S.H. RODGER, T.W. FINLEY; "JFLAP: An Interactive Formal Languages and Automata Package". Jones and Bartlett, 2006

Detailed bibliography

- S. ARORA, B. BARAK: "Computational Complexity: A Modern Approach" Cambridge University, 2009.
- D. WOOD; "Theory of computation". John Wiley & Sons, 1987.
- T. MITCHELL: "Machine Learning" McGraw Hill, 1997
- G.F. LUGER, W.A. STUBBLEFIELD: "Artificial Intelligence. Structures and Strategies for Complex Problem Solving." Benjamin/Cummings Publishing Company, Inc, 1998.

Journals

Web sites of interest

- Visual and interctive tools (JFLAP): http://www.jflap.org/
- Machine Learning theory and examples: http://www.cs.cmu.edu/~avrim/ML07/index.html
- AI algorithms Implementation in Java: https://github.com/aima-java/aima-java

OBSERVATIONS

Universidad del País Vasco — Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty 163 - Faculty of Engineering - Vitoria-Gasteiz **Cycle** .

Degree GIIGSI10 - Bachelor's Degree in Computer Engineering in Management and In **Year** Second year

COURSE

26023 - Operations Research **Credits, ECTS:** 6

COURSE DESCRIPTION

"Operational Research" is an area of study originated during the Second World War, basically, it consists of applying the scientific method (making use of mathematic models, statistics and algorithms) in order to model and solve complex problems.
Most of the situations try to find an optimal use of the resources, which are subjected to a series of limiting conditions. The applications are wide and include the manufacturing improvement, business management and programming.

In its current state "Operational Research" covers a wide range of topics such as linear and nonlinear programming, simulation, graph theory and so on. The aim of this academic subject is having a first approach to the problems, tools and strategies considered here, as well as to acquire basic/medium competences in order to be able to employ these techniques in productive contexts.

The subject is part of the module regarding "basic training", in particular, inside the unit of "mathematics", and gives answer to the competence CM01 ("being able to solve mathematic problems in Engineering. Capability to use efficiently Algebra, Calculus, Numeric Methods, Statistics and Optimization"). It complements the rest of subjects on mathematics that are seen during the studies.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

During the course, some deterministic methods concerning "Operational Research" aimed at solving lineal models will be revised.
As for the competences that students will acquire, the following ones can be stressed:
C1.- Application of the scientific method in problems related with the control of organizations or systems so as to improve the solutions.
C2, C5, C6.- Understanding of real problems and ability to model them mathematically under different circumstances.
C3.- Employ specific mathematic tools.
C4.- Analyzing how changes in inputs might affect to the outputs of a model (sensibility).
CT.- Autonomous learning, goind deeper in the study of the contents related with the subject.

Theoretical and Practical Contents

Chapter 1: Introduction.
Definition of the subject, stages of implantation and critical assessment of the method.
Chapter 2: Linear programming, basics.
Definition of a lineal program and graphic solution.
Chapter 3: Simplex method.
Description, uses, variations and computational issues.
Chapter 4: Duality.
Dual formulation and properties.
Chapter 5: Analysis of sensibility.
Study of the changes in the solutions due to changes in the initial conditions.
Chapter 6: Integer linear programming.
Problem solving when the variables have to take only integer values. Specific algorithms.
Chapter 7: Model of transportation.
Application to the transportation and related problems.
Chapter 8: Variatiations to the model of transportation (other models based on graphs).

TEACHING METHODS

During part of the sessions, the lecturer will explain the concepts about each lesson and propose points of discussion with students; therefore, participative sessions will be greatly encouraged. Complementarily, some sessions will be dedicated to practical exercises. The students will also work in groups developing a personal case study that will be part of the evaluation.
All teaching material will be available in the virtual classroom and students will have at their disposal a wide range of virtual tools for studying and communicating with their colleagues and with the lecturer.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	45		15						
Horas de Actividad No Presencial del Alumno/a	67,5		22,5						

Legend: M: Lecture-based | S: Seminar | GA: Applied classroom-based groups | GL: Applied laboratory-based groups | GO: Applied computer-based groups | GCL: Applied clinical-based groups | TA: Workshop | TI: Industrial workshop | GCA: Applied fieldwork groups

Evaluation methods

- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 60%
- Teamwork assignments (problem solving, Project design) 20%
- Actividades en el aula virtual 20%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Final exam: 60% (a minimum result of 4.5/10 is asked).
Continuous evaluation by means of exercises gathered along the semester (20%).
Work in group (20%).

Students who do not want to follow the aforementioned evaluation system will have the possibility to be evaluated only with a final exam.

Students will abide with all pertinents rules about the evaluation, in particular they will keep in mind the following norms (https://www.ehu.eus/es/web/graduak/normativa/reglamento-del-alumnado-de-la-upv-ehu):
- Students's regulation.
- Regulation for students' evaluation.
- Code of ethics.

During the final exam, study notes can be used provided students meet the following criteria:
a) the material for consultation is for each specific student and cannot be shared.
b) only documents in print will be allowed, no electronic devices (such as laptops, tablets or mobile phones).
c) notes will never got mixed with the exam. During the exercise, notes will be placed at the side, students will be allowed to check them at any moment but will have to let them back to the very place after consulting.
d) students cannot add to the exam any piece of previously elaborated material.

Students will carry their calculators for the exam, as well as some basic materials for drawing (e.g. a ruler) in order to improve the drawing up of charts.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

By means of a written exam (100% of the mark). Previous work done along the semester will not be considered in the extraordinary call.

MANDATORY MATERIALS

Materials in the virtual classroom.

BIBLIOGRAPHY

Basic bibliography

"Operations research : an introduction"
Taha, Hamdy A.
Ed. Prentice-Hall

"Linear programming : foundations and extensions"
Robert J Vanderbei
Ed. Springer

Detailed bibliography

"Elementary linear programming with applications"
Bernard Kolman, Robert E Beck, Robert Edward Beck
San Diego Academic Press

Journals

https://link-springer-com.ehu.idm.oclc.org/journal/41274
https://www-sciencedirect-com.ehu.idm.oclc.org/journal/european-journal-of-operational-research

Web sites of interest

https://www.ehu.eus/es/web/dma

OBSERVATIONS

Universidad del País Vasco — Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty 163 - Faculty of Engineering - Vitoria-Gasteiz **Cycle** .

Degree GIIGSI10 - Bachelor's Degree in Computer Engineering in Management and In **Year** Third year

COURSE

26025 - Information System Security Management Systems **Credits, ECTS:** 6

COURSE DESCRIPTION

This subject course combines two essential aspects of the degree: Management Systems and Information Systems. Situated within business organisations, it identifies the importance of the three pillars of cybersecurity for business continuity: Confidentiality, Integrity and Availability.
It works with the precise vocabulary of the security context to make possible a diagnosis tailored to each organisation's needs to open the way to constant improvement by means of Management Systems through the gradual reduction of vulnerabilities and the establishment of safeguards, without forgetting staff training and awareness-raising.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

- Being familiar with the main concepts necessary for risk analysis and management in information systems
- Being familiar with the features of security management standards in information systems
- Designing, planning and implementing adequate IT security policies and measures in terms of effectiveness and cost
- Integrating technical IT security know-how into ethical, legal and organisational planning
- Being able to perform technical tasks that make up an information system security management system, such as proper control of passwords, backup copies, encryption, use of anti-malware, auditing and physical security.
- Designing training plans for people connected with information systems
- Efficient group working to coordinate technical and organisational tasks
- Being familiar with the legal framework governing professional practice (General Data Protection Regulation, Information Society Services Act and Digital Signature Act)

Theoretical and Practical Contents

- Information System Security Risk Analysis and Management
- Backing up information and security copies
- Controlling access to information resources: identification and authentication. The digital signature
- Malware: security risks and measures
- The human factor
- Encrypting information: contexts of use and basic techniques
- Software protection
- Planning, organisation and administration of IT security, audits: technical and standard
- Legal, ethical and organisational aspects: General Data Protection Regulation, Information Society Services Act and Digital Signature Act

TEACHING METHODS

Lectures (M) introduce concepts in presentations that are published on the eGela platform, allowing discussion of the main pillars of Security Management in the context of organisations and its importance in Information Systems.
Practical work (GL) makes it possible to approach typical security issues through individual and group reflection. This can take different forms and includes the study of scientific articles, press articles, pair work exercises, group protective software selection processes and active participation in conferences on security and personal data protection, among others. The work is submitted as reports and public presentations and is assessed by the lecturer and by colleagues.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	45			15					
Horas de Actividad No Presencial del Alumno/a	67,5			22,5					

Legend:
M: Lecture-based — S: Seminar — GA: Applied classroom-based groups
GL: Applied laboratory-based groups — GO: Applied computer-based groups — GCL: Applied clinical-based groups
TA: Workshop — TI: Industrial workshop — GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 60%
- Exercises, cases or problem sets 40%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Obligatory tasks of different kinds will be set during the course, both individually and as a group. Deliverables will consist of reports and presentations to give in class, assessed by the lecturer and by colleagues according to predetermined criteria.
For continuous assessment practical work, reports and presentations will be worth 40% of the final mark. There will be a final written examination worth 60% of the final mark, in which a minimum of 3.5 out of 10 must be scored to pass the course.
If continuous assessment is waived there will be a final examination worth 100% of the mark. The lecturer must be informed of this waiver by the 9th week, in accordance with current regulations.
If the final examination is not attended it will be considered not sat.
If the course cannot be assessed face-to-face, the relevant changes will be made to carry it out online by using the IT tools available at the UPV/EHU. The particulars of this online assessment will be made public.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Assessment of the extraordinary session will be by a single written examination covering the topics seen in the lectures and laboratory work, updating cases from one year to the next. Relevant material produced by students will be made available for reference to the rest of the eGela platform.

MANDATORY MATERIALS

Class notes, classroom and laboratory teaching support material. Data Protection Act, Information Society Services Act and Digital Signature Act.

BIBLIOGRAPHY

Basic bibliography

- Álvaro Gómez Vieites, "Enciclopedia de la Seguridad Informática", Ra-Ma 2011 (2ª edición actualizada)
- Jesús Costas Santos, "Seguridad y Alta Disponibilidad", Ra-Ma 2011.

Detailed bibliography

- Yves-Michel Leporcher, Frédéric Goujon y Billal Chouli, "Blockchain. De la teoría a la práctica, de la idea a la implementación", ENI ediciones, 2020
- ACISSI, "Seguridad Informática – Ethical Hacking. Conocer el ataque para una mejor defensa", 2ª ed,ENI ediciones, 2013
C.J. Bennett y C.D. Raab, "The governance of privacy", MIT Press 2006
- B. Schneier, "Beyond Fear: Thinking Sensibly About Security in an Uncertain World", Springer, 2006.

Journals

IEEE Security & Privacy

- .Seguridad
https://revista.seguridad.unam.mx/ (acceso 20/05/2024)

Web sites of interest

- INCIBE: Instituto Nacional de Ciberseguridad (antes INTECO)
https://www.incibe.es (access: 20/05/2024)
- Criptored: red telemática de criptografía y seguridad de la información
https://www.criptored.es/ (access: 20/05/2024)
- Intypedia: Information Security Encyclopedia
https://intypedia.com/ (access: 20/05/2024)
- RedIRIS: Servicio de Seguridad
https://www.rediris.es/cert/ (access: 20/05/2024)
- SBD: Security By Default
http://www.securitybydefault.com/ (access: 20/05/2024)
- Hispasec
https://hispasec.com/ (access: 20/05/2024)
- Agencias Española y Vasca de Protección de Datos
https://www.aepd.es/ (access: 20/05/2024)
https://www.avpd.euskadi.eus/ (access: 20/05/2024)
- Un informático en el lado del mal (Chema Alonso)
https://www.elladodelmal.com/ (access: 20/05/2024)
- Softzone (seguridad)
https://www.softzone.es/category/seguridad/ (access: 20/05/2024)
- Cyberseguridad

https://cyberseguridad.net/ (access: 20/05/2024)
- Noticias seguridad
https://noticiasseguridad.com/ (access: 20/05/2024)

OBSERVATIONS

Universidad del País Vasco — Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty 163 - Faculty of Engineering - Vitoria-Gasteiz **Cycle** .

Degree GIIGSI10 - Bachelor's Degree in Computer Engineering in Management and In **Year** Third year

COURSE

26027 - Systems for Supporting Decision-making **Credits, ECTS:** 6

COURSE DESCRIPTION

1. The subject of SAD is in the third year and is part of the Information Systems module within the Bachelor's Degree in Management and Information Systems Engineering.
2. This subject requires competencies and knowledge developed and acquired in first-year Algebra as well as the subject of Statistical Methods in Engineering, as several of the concepts seen in a generic way in these subjects are later developed and applied for the study of Computer Engineering Methods specialized in the analysis of complex data and support in decision-making and process control. This subject develops techniques specific to Computational Intelligence that can be applied in practically any engineering field, and more specifically in data processing, for solving complex problems. This subject is complemented by the subject of Languages, Computing, and Intelligent Systems, where complementary issues are studied such as Turing Machines. This subject allows the acquisition of competencies for the development and research of applications where Computational Intelligence is widely applied: processing large amounts of information, processing complex data, decision-making in uncertain environments, etc. In fact, this subject works very significantly on the cross-cutting competencies of Innovation and Autonomous Learning because the area addressed by the subject is an area of great scientific interest where research is of great importance.
3. Although mastering mathematical concepts and basic programming skills is interesting, the most important thing is to have a strong Curiosity typical of anyone interested in Engineering.
4. As mentioned earlier, the knowledge and competencies acquired in this subject are currently of great scientific interest where new algorithms and concepts are proposed every year. Therefore, the field where this knowledge is applied is of interest to research centers, companies with a strong scientific or technological component, as well as companies that wish to make decisions based on available evidence and data, as well as those that wish to control processes of complex dynamics.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

Statistical techniques in risk analysis and quality control.
Fundamentals and techniques of Business Intelligence.
Decision support systems.
Modeling of economic-business systems. Financial derivatives: Risk management.
Applications (E-commerce, Decision support environment, Instruments on interest rates, risk, and valuation).

Theoretical and Practical Contents

Decision problems: Process and environment of a decision problem. Components, symbolic representation, classification.
Decision support systems: Preference systems. Representation systems. Concept and architecture. Classification. Evaluation of DSS systems.
Deterministic utility theories and expected utility: Existence and uniqueness of value functions. Decomposition rules. Bernoulli's principle. Mixture spaces. Construction and decomposition of expected utility functions.
Allocation methodologies: Decision trees and influence diagrams. Direct assignment of value/utility functions. Methods based on sequential elimination. Methods based on indifference curves. Construction of a decision tree. Resolution of a decision tree. Value of information. Definition of an influence diagram. Specific cases. Inference in an influence diagram. Construction and machine learning of decision support systems.
Business Intelligence, fundamentals, and techniques: Concepts and mathematical foundation. Data warehousing (repository). Data Mining and online transaction processing (OLTP). Business Intelligence: Systems and software. Quality control in production and service processes.
Risk management: Modeling in the financial world. Derivatives (options, futures, and swaps). Financial risk and its measurement. Market valuation. Instruments on interest rates, risk, and valuation. Acceptance sampling and reliability of systems.
Analysis of medical decisions: Application of Bayesian networks and influence diagrams to medical decisions.

TEACHING METHODS

A more detailed teaching guide can be achieved through the Moodle platform.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	45			15					
Horas de Actividad No Presencial del Alumno/a	67,5			22,5					

Legend:
M: Lecture-based — S: Seminar — GA: Applied classroom-based groups
GL: Applied laboratory-based groups — GO: Applied computer-based groups — GCL: Applied clinical-based groups
TA: Workshop — TI: Industrial workshop — GCA: Applied fieldwork groups

Evaluation methods

- End-of-course evaluation

Evaluation tools and percentages of final mark

- Exercises, cases or problem sets 30%
- Teamwork assignments (problem solving, Project design) 70%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

1. Written exam on the first 2 topics. 3.5 points out of the total. Midway through the course.

2. Written exam on the last 2 topics. 3.5 points out of the total. At the end of the course.

3. Laboratory practices. 3 points out of the total. Throughout the course.

If the student obtains half of the points assigned to the first exam, the grade will be saved to be added to the rest of the scores. If not, the student must take the second exam, which will then be worth 7 points and will cover all topics. Therefore, the first exam serves to cover part of the syllabus.

The final grade will be the sum of the 3 assessments. The course is passed by achieving a final grade of 5, with a minimum of 3.5 points in the sum of the 2 exam grades.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

For those who have followed the regular assessment and have not passed in the regular examination period, they will be asked to submit the assignments requested during the course with the corrections proposed during the course. In case of tasks not completed, they must complete and submit them by the exam date proposed for the regular examination period. If not submitted within that timeframe, they will be graded as not submitted.

For those who have requested a single final evaluation, they must take a single final exam, which will include, among other types of exercises, solving problems typical of the practices such as simple programming exercises in Matlab. They may also be asked to respond to questions related to the cross-cutting competencies of the subject (Innovation and Autonomous Learning).

MANDATORY MATERIALS

Notes will be available through the Moodle platform.

BIBLIOGRAPHY

Basic bibliography

S. Ríos, C. Bielza, A. Mateos. Fundamentos de los sistemas de ayuda a la decisión. Ra-Ma, 2002.
O.G. León. Tomar decisiones difíciles. McGraw Hill, 2000
S. Holtzman. Intelligent decision systems. Addison Wesley, 1989.
Business intelligence: Técnicas de análisis para la toma de decisiones. Elizabeth Vitt, Michael Luckevich, Stacia Misner. McGraw-Hill 2003.
Francisco Javier Díez Vegas, Teoría probabilista de la decisión en medicina. Informe Técnico CISIAD-07-01 UNED, Madrid 2007.
Francisco Javier, Díez, Introducción a los modelos gráficos probabilistas, Departamento de Inteligencia Artificial, Uned, Octubre de 2007

Detailed bibliography

- Alex Berson and Stephen J. Smith. Data Warehousing, Data Mining & OLAP. McGraw-Hill, 2001
- M.S. Silver. Systems that support decision makers: description and analysis. Wiley, 1991.
- George Marakas. Decision Support Systems. Prentice Hall, 2001.
- Sistemas Expertos y Modelos de Redes Probabilisticas, Enrique Castillo y otros, Universidad de Cantabria.

Journals

Decission Support Systems
Elsevier

Web sites of interest

http://dssresources.com

OBSERVATIONS

Universidad del País Vasco — Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty 163 - Faculty of Engineering - Vitoria-Gasteiz **Cycle** .

Degree GIIGSI10 - Bachelor's Degree in Computer Engineering in Management and In **Year** Third year

COURSE

26028 - Business Management Software **Credits, ECTS:** 6

COURSE DESCRIPTION

The aim of the course is for the student to learn the main elements of a business information system, as well as the software solutions aimed at supporting the different areas, both separately and integrally. An introduction to ERP, CRM, EIS and DSS is covered. In addition, the multiple software development models that are applied at the enterprise level are introduced.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

The competences of the subject are those indicated below:

- C1 Knowing the fundamental aspects that constitute the information systems in typical business organisations and their interrelationships.
- C2 Knowing the role played by integrated software solutions in the support of the organisation's processes, as well as their impact on the opening of new business models (e-business).
- C3 Knowing the basic characteristics of ERP solutions (resource planning and management).
- C4 Knowing the basic characteristics of CRM solutions (customer relations).
- C5 Know the basic aspects of the financial, accounting, purchasing, sales and human resources modules.
- C6 Know the basic characteristics of information and decision support systems.
- C7 Know the fundamental steps for the implementation and maintenance of ERP and CRM solutions.
- C8 Knowing the main solutions offered by the market, as well as their main features of functionality and cost.

Theoretical and Practical Contents

1.- Introduction to Information Systems/Business Management Software
2.- Methodologies and modelling
3.- Information systems in business functions
4.- Data and knowledge management
5.- Information requirements
6.- Organisation of systems
7.- Planning
8.- Design
9.- Controls
10.- Privacy/Ethics

TEACHING METHODS

The teaching methodology used in the course will be based fundamentally on the methodologies described above, but improved with the intention of improving the student's learning process:
- lectures (expository method)
- exercise resolution, case studies and practical activities.
- Collaborative project-based learning (which will include computer practice).

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	45			15					
Horas de Actividad No Presencial del Alumno/a	67,5			22,5					

Legend:
M: Lecture-based — S: Seminar — GA: Applied classroom-based groups
GL: Applied laboratory-based groups — GO: Applied computer-based groups — GCL: Applied clinical-based groups
TA: Workshop — TI: Industrial workshop — GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 50%
- Multiple choice test 10%
- Oral defence 5%
- Exercises, cases or problem sets 30%
- Teamwork assignments (problem solving, Project design) 5%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Mixed assessment in the ORDINARY and EXTRAORDINARY exams:
Final mark = 0.40 x Group work + 0.60 x Written exam.

Assessment of group work:
25%: Team work
25%: Oral defence of the practical case study by each member of the group.
50%: Realisation of the practical (Implementation of the solution)

The above formula will only be applied in the event that the student has carried out the oral defence, has actively participated in the group work and has passed (mark of 5 or more) both the practical work and the written exam; otherwise, a fail will appear in the minutes.

GRADING IN THE MINUTES:
-According to article 8 point 3-. ‘In any case, students will have the right to be assessed by means of the final assessment system, regardless of whether or not they have participated in the continuous assessment system. To do so, students must submit a written waiver of continuous assessment to the lecturers responsible for the subject, for which they will have a period of 9 weeks for four-monthly subjects and 18 weeks for annual subjects, starting from the beginning of the four-month period or academic year respectively, in accordance with the School's academic calendar’.

https://www.ehu.eus/es/web/estudiosdegrado-gradukoikasketak/ebaluaziorako-arautegia#NormativadeEvaluaci%C3%B31

Exceptional cases must be communicated to the teacher at the beginning of the subject or when the exceptional circumstance occurs, if it occurs during the four-month period.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

If the student has not opted for continuous assessment, he/she will have to take an exam covering 100% of the subject.

MANDATORY MATERIALS

Computer with internet access.
Moodle, slides and documentation provided during the course.

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Web sites of interest

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lamp.infosys.deakin.edu.au/journals
http://uwaterloo.ca/information-systems-technology/
is.njit.edu/
http://www.northropgrumman.com/aboutus/businesssectors/informationsystems/Pages/default.aspx

OBSERVATIONS

Universidad del País Vasco — Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty 163 - Faculty of Engineering - Vitoria-Gasteiz **Cycle** .

Degree GIIGSI10 - Bachelor's Degree in Computer Engineering in Management and In **Year** Third year

COURSE

26029 - Web Systems **Credits, ECTS:** 6

COURSE DESCRIPTION

The mandatory subject for the 3rd year, "Web Systems," has a terminal nature (regarding the mandatory aspect of the curriculum) concerning the communications of computer systems.

It is assumed that students are fairly proficient with the concepts from the subject "Introduction to Computer Networks" (although it may not yet be passed).

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

The course covers the fundamental aspects that support information systems on the web, tracing the historical evolution of the web, its technological support, the architecture of its applications, and the technologies currently used on both the client and server sides. Advanced topics include knowledge of the fundamentals of web services, the architecture of emerging information systems, and the increasingly important ones. The objective of the course is for students to become familiar with the technologies used in web development and to gain a solid understanding of the field.

Theoretical and Practical Contents

- History, Evolution, and Functioning of the Web
- Current Professional Roles in Web Development: Frontend Developer, Backend Developer, DevOps Engineer.

*Client-Side Technologies
- HTML, CSS, JavaScript, TypeScript.
- CSS or Style Libraries: Bootstrap, Material, etc.
- Client-Side Application Development using Frameworks (Angular, React).
- Accessing Back-End Systems: REST APIs, GraphQL. Using Postman for API Testing.

*Server-Side Technologies
- Overview of Current Databases (Relational, Non-Relational, Timebase)
- Introduction to CI/CD and DevOps Tasks.
- Concepts of Containers (Docker + Kubernetes).
- Overview of Cloud Services for Web Development (Azure, AWS, Google Cloud)
- Version Control Systems Based on Git
- Monitoring Applications and Systems (Prometheus, Kibana, etc.)
- Server-Side Development using Node + Express.
- Concepts of Microservices vs. Monolithic Application.

*Student Presentations on a Technology

TEACHING METHODS

The teaching methodology is based on cooperative learning, primarily utilizing group work and autonomous learning.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	45			15					
Horas de Actividad No Presencial del Alumno/a	67,5			22,5					

Legend:
M: Lecture-based — S: Seminar — GA: Applied classroom-based groups
GL: Applied laboratory-based groups — GO: Applied computer-based groups — GCL: Applied clinical-based groups
TA: Workshop — TI: Industrial workshop — GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Exercises, cases or problem sets 25%
- Teamwork assignments (problem solving, Project design) 75%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The final grade for the course is obtained as follows (weighted according to the credit distribution of the theoretical and practical parts):

Final Grade = (Theory Evaluation Grade) x 0.75 + (Practical Part Grade) x 0.25

The Theory Evaluation Grade is determined differently based on the following two alternatives:

Final Evaluation Alternative: A theoretical exam is conducted from which the theory grade is obtained.

Continuous Evaluation Alternative: Conducted after theory classes, where a series of exercises/tasks are proposed to facilitate the understanding of what has been explained and to develop specific and transversal competencies. The student must complete tasks throughout the course. The final theory grade in this case is obtained as follows:

- Class Attendance [0-1 point]: One point is distributed among the number of theory class days. Attendance is monitored, and the proportional part is obtained for each attendance. To opt for continuous evaluation, the student must attend at least 85% of the classes.
- Class Tasks [0-6 points].
- Final Full-Stack Task [0-3 points].

The Practical Part Grade is obtained through the completion of a practical project that lasts throughout the course.

According to the Regulations Governing the Evaluation of Students in Official Undergraduate Degrees, Chapter II, Article 8, Section 3, all students have the right to be evaluated through the final evaluation system, regardless of whether or not they have participated in the continuous evaluation system. To do this, students must submit a written request to the instructor responsible for the course to opt out of continuous evaluation. They will have a period of 9 weeks from the beginning of the semester, according to the academic calendar of the institution.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

According to the Regulations Governing the Evaluation of Students in Official Undergraduate Degrees, Chapter II, Article 9, Section 2, this type of evaluation will be conducted exclusively through the final evaluation system. Furthermore, according to Section 3 of the aforementioned article, this assessment may consist of as many exams and evaluation activities as necessary.

MANDATORY MATERIALS

Class notes, support material for classroom and laboratory teaching.
Given the high technological component of the subject and the great dynamism of these technologies, the teaching team will indicate the mandatory materials for the course (if any) at the beginning of the term.

BIBLIOGRAPHY

Basic bibliography

An Introduction to XML and Web Technologies
Anders Møller and Michael I. Schwartzbach
Addison-Wesley, Enero 2006

Detailed bibliography

Software Engineering for Internet Applications
Eve Andersson, Philip Greenspun, and Andrew Grumet
MIT Press 2006; ISBN 0262511916
KAPPEL, Gerti et al. (Eds.) Web Engineering, John Wiley & Sons, 2006.
SHKLAR, Leon et al. Web Application Architecture: Principles, Protocols and Practices, John Wiley & Sons, 2003

Journals

Web sites of interest

http://www.w3.org/
http://www.librosweb.es/

OBSERVATIONS

Universidad del País Vasco — Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty 163 - Faculty of Engineering - Vitoria-Gasteiz **Cycle** .

Degree GIIGSI10 - Bachelor's Degree in Computer Engineering in Management and In **Year** Third year

COURSE

26030 - Administration of Databases **Credits, ECTS:** 6

COURSE DESCRIPTION

Database Administration is the last database-related subject in the degree, right after Databases and Database Design.

Being administration the focus of this subject, it is also close to Introduction to Operative Systems and Introduction to Computer Networks.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

Functions of the DB Administrator. Installation & Configuration of DBMS. DB security. DB audit. Recovery Techniques. Concurrency Control. BD adjustment (Optimization and tuning). Distributed data management.

Theoretical and Practical Contents

The Data Administrator. The general problems of a DBMS and the basic tasks of the administrator are presented. A DBMS is installed and configured for start-up.
Security. The difference between user account and role is explained. The two models of database access control are presented, based on privileges and based on levels, delving into the first.
Audit. The options for performing an audit of the DB are presented.
Recovery The options for making backup copies and how to recover a consistent state of the DB after a system failure are explained. The notion of Diary and its participation in the recovery of a consistent state of the BD is explained.
Concurrency Control. Several concurrency control protocols are presented: reservations, timestamps, and validation.
Tuning. Recommendations are presented for the physical design and optimization of DBs. The characteristics offered by DBMSs are analyzed to perform application performance analysis and adjustment (tuning) of the DB configuration characteristics.
Distributed data management The features offered by DBMSs to manage data distribution and replication are presented.

TEACHING METHODS

In the master classes, sessions will be held to present concepts, reinforced with examples of situations in which said concepts must be used.

In the laboratories, a set of exercises uploaded to the virtual campus will be implemented in advance of the laboratory. The sessions require prior preparation work on these exercises. The proposed exercises must be carried out in the proposed order, since the order affects the state in which the BDs must remain after completing them. The exercises to be carried out pose situations during the course of each laboratory that the students must face in the most autonomous way possible.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	45			15					
Horas de Actividad No Presencial del Alumno/a	67,5			22,5					

Legend:
M: Lecture-based — S: Seminar — GA: Applied classroom-based groups
GL: Applied laboratory-based groups — GO: Applied computer-based groups — GCL: Applied clinical-based groups
TA: Workshop — TI: Industrial workshop — GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Multiple choice test 20%
- Exercises, cases or problem sets 30%
- Teamwork assignments (problem solving, Project design) 50%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The evaluation of the subject in the ORDINARY call is carried out through continuous evaluation. The final grade for the subject is calculated based on the grades of 3 planned midterm exams and the exercises and laboratories carried out during the course.

The student will be considered to have taken the ORDINARY call if he or she has taken at least 2 of the partial exams indicated above. If you do not attend at least the 2 mentioned midterms, the grade will be Not Presented. A global exam of

the subject is not allowed in the ordinary call, except in the exception in the evaluation modality that is discussed later.

Students who do not pass the ordinary session must take the exam in an EXTRAORDINARY session in which they will be evaluated in a global exam of the entire subject.

EXCEPTION in the evaluation modality:

- Only exceptional cases justified at the beginning of the course and included in article 43 of the current regulations regarding student evaluation will be eligible for a single exam for 100% of the final grade.

- Exceptional cases must be communicated to the teacher at the beginning of the subject or when the exceptional circumstance occurs, if it occurs throughout the semester.

- The justification must be adequately documented.

- Exceptional cases will not be accepted after.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The extraordinary call consists of a 10-point exam in which the theoretical knowledge, practical aspects and practice developed during the course are evaluated.

To pass the subject, it is necessary to obtain a minimum grade of 5 points out of the total of 10 for the subject.

To waive the right to the exam, it will be enough to not appear.

NOTE:
The evaluation grade obtained in the ordinary call for the theory and laboratory parts is not saved.

MANDATORY MATERIALS

- Subject material (Notes and Practices)
- eGela Virtual Platform of the UPV/EHU for the subject "Database Administration"

BIBLIOGRAPHY

Basic bibliography

Fundamentos de Sistemas de Bases de Datos. R.A. Elmasri eta S.B. Navathe. Addison-Wesley, 2007.
Fundamentos de Bases de Datos. A. Silberschatz, H.F. Korth eta S. Sudarshan. McGraw-Hill, 2002.
Sistemas de Bases de Datos. Un enfoque práctico para diseño, implementación y gestión. T. Connolly eta C. Begg. Addison-Wesley, 2005.
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Principles of Distributed Database Systems. M.T. Ozsu, P Valduriez. Prentice Hall, 1999.
Distributed Database Systems. D. Bell and J. Grimson. Addison-Wesley, 1992.
Managing Distributed Databases. Building bridges between database islands. D.K. Burleson. J. Wiley & sons, 1994.
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Expert Oracle Database 10g Administration. S. Alapati. Apress, 2005.
Database Tuning. Principles, Experiments and Troubleshooting Techniques. D. Shasha eta P. Bonnet. Morgan-Kaufmann, 2003.
Oracle database 10g new features : Oracle 10g reference for advanced tuning & administration / Mike Ault, Daniel Liu, Madhu Tumma, 2008.

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Fundamentos de Bases de Datos. A. Silberschatz, H.F. Korth eta S. Sudarshan. McGraw-Hill, 2002.
Data Base Principles Programming Performance. P. O.Neil. Morgan Kaufmann, 1994
Principles of Distributed Database Systems. M.T. Ozsu, P Valduriez. Prentice Hall, 1999.
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Expert Oracle Database 10g Administration. S. Alapati. Apress, 2005.
Database Tuning. Principles, Experiments and Troubleshooting Techniques. D. Shasha eta P. Bonnet. Morgan-Kaufmann, 2003.
Oracle database 10g new features : Oracle 10g reference for advanced tuning & administration / Mike Ault, Daniel Liu, Madhu Tumma, 2008.
The Manga Guide to Databases. Mana Takahashi, Shoko Azuma, Trend-Pro Co. Ltd. No Starch Press, 2009.

Journals

Oracle Magazine:

http://www.oracle.com/technetwork/oramag/magazine/home/index.html

Web sites of interest

Oracle Web: technet.oracle.com
Oracle-10g en la red de la facultad: http://www.sc.ehu.es/siwebso/KZCC/eusk/index.htm

OBSERVATIONS

Universidad del País Vasco — Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty 163 - Faculty of Engineering - Vitoria-Gasteiz **Cycle** .

Degree GIIGSI10 - Bachelor's Degree in Computer Engineering in Management and In **Year** First year

COURSE

26031 - Basic Programming **Credits, ECTS:** 6

COURSE DESCRIPTION

The subject of Basic Programming introduces students to the field of software development. This subject is the first step in the training of students in the development of programs in the degree course.

The main goals of this module are:
1. Learn the application developmen methodology: specification, algorithm design following a top-down approach and implementation.
2. Learn to document the solution following the methodology.
3. Be abble to deal with problems that require working with lists and data sequences.
4. Be able to understan and use the main programming structures:
   a. Control structures: sequential, conditional and iterative structures.
   b. Functions and procedures.
   c. Data structures.
5. Implement the structures in a particular language: Java.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

The competences to be acquired in the subject are:

- Ability to analyse and explain the behaviour of programs that contain: instructions, I/O operations, iteration, sub-programs.
- Ability to divide a problem into logical parts that can be solved (programmed) independently.
- Ability to design simple algorithms to solve problems, implement them, test them and fine-tune them. Ability to write code in accordance with rules of good practice.
- Knowledge, design and efficient use of the most suitable types and structures of data for problem-solving.
- Knowledge of basic algorithmic procedures in IT technologies for design solutions to problems, analysing the suitability and complexity of the algorithms proposed

Theoretical and Practical Contents

1.- Introduction
This chapter introduces programming, focusing on the methodology that entails several steps (specification, algorithm design, implementation and test). It highlights the importance of the algorithm design.

2.- Elementary concepts for programming
Throughout this chapter, the student will learn the basics of algorithm design and programming.

3.- Functions and procedures
In this chapter the student will learn to design and implement subprograms.

4.- Control structures and algorithm templates
This chapter covers the conditional and iteravi structures. In addition, the main algorithm templates will be presented.

5.- Data structures
This chapter presents the mechanisms to define complex data structures and lists.

TEACHING METHODS

During lectures, explanations of concepts will be combined with the performance of exercises.
In the laboratories, a set of exercises distributed in advance will be implemented in pairs and must be handed in for evaluation. The sessions require a previous preparation work on these exercises.
In some laboratories individual controls will be carried out to verify the assimilation of the contents taught so far.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	30				30				
Horas de Actividad No Presencial del Alumno/a	45				45				

Legend: M: Lecture-based | S: Seminar | GA: Applied classroom-based groups | GL: Applied laboratory-based groups | GO: Applied computer-based groups | GCL: Applied clinical-based groups | TA: Workshop | TI: Industrial workshop | GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 55%
- Exercises, cases or problem sets 20%
- Individual assignments 25%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Assessment in the ORDINARY call will be done under continuous assessment or final assessment. By default, all students will do continuous assessment unless they withdraw from it.

* FINAL ASSESSMENT
The student may withdraw from continuous assessment to do final assessment (final exam). This withdrawal will be presented in writing to the professor responsible for the subject in the periods established in Article 8 of the Rules on Assessment of Students. Exceptional cases will not be accepted, nor can students withdraw from continuous assessment after the stated dates.

* CONTINUOUS ASSESSMENT

The final grade of the subject is calculated on the basis of the exam marks (55%), laboratory work (35%) and individual practical tests (25%).

* GRADING IN MINUTES:

Students who have not withdrawn from continuous assessment will be considered as presented for the ORDINARY call.

To pass the subject, the student must take all the exams and obtain a minimum final grade of 5 out of 10. The student must also score at least 3 out of 10 and 4 out of 10 in the grade corresponding to the exams, and a weighted average of 4.5, in order to take into account the laboratory and practical work grades. Otherwise, the grade obtained will the average marks of the exams.

* WITHDRAWAL FROM THE EXAM
A student who, having opted for final assessment, does not present him/herself for the ORDINARY call will be graded as "NOT PRESENTED". A student who takes continuous assessment may withdraw from the call as per stipulated in Article 12 of the Rules on Student Assessment.

* CASES OF COPYING/PLAGIARISM
Article 11 of the current rules on student assessment will be applied. Any student involved in a plagiarism/copying case will automatically fail the ordinary call

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The evaluation of the course in the EXTRAORDINARY call is done by means of a final evaluation.
The exam evaluates the theoretical and practical knowledge developed during the course.

To withdraw from this exam, it is sufficient not to appear on the day.

* CASES OF COPYING/PLAGIARISM
Article 11 of the current rules on student assessment will be applied. Any student involved in a plagiarism/copying case will automatically fail the extraordinary call

MANDATORY MATERIALS

Course material in egela

BIBLIOGRAPHY

Basic bibliography

"Una Introducción a la programación. Un enfoque algorítmico". J.J.Garcia, F.J. Montoya,J.L Fernandez, M.J. Majado
Thomson Ed. 2005
"Oinarrizko Programazioa. Ariketa-bilduma" Díaz de Ilarraza A., Sarasola K.
Udako Euskal Unibertsitatea, 1999.

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"La práctica de la programación". B.W. Kernighan, R. Pike.
Prentice Hall. Ed, 2000.
Code Complete: A Practical Handbook of Software Construction. Steve McConnell.
Microsoft Press, 2004.

Journals

Web sites of interest

es.wikibooks.org/wiki/Fundamentos_de_programación

OBSERVATIONS

Universidad del País Vasco — Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty	163 - Faculty of Engineering - Vitoria-Gasteiz	**Cycle**	.
Degree	GIAUTO10 - Bachelor's Degree in Automotive Engineering - DUAL	**Year**	Second year

COURSE

28125 - Electrical Circuit Analysis — **ECTS Credits:** 6

COURSE DESCRIPTION

The compulsory subject "Electrical Circuit Analysis" is taught in the first semester of the second year of the Degree in Automotive Engineering. The subject will provide students with knowledge and tools to analyse the operation of electrical and magnetic circuits.
In this subject, calculation tools are used, such as complex numbers and systems of linear equations, which have been studied in the subjects of Calculus and Algebra. In addition, the knowledge acquired in the ICT Fundamentals subject will be useful to solve circuit analysis exercises with the help of computers.
The skills and learning results obtained in this subject will be applied in the 2nd semester subjects of the same course: Electric Machines and Traction, Vehicle Systems Control and Driving Assistance Systems and Automotive Electronics; and also in the 3rd year: Automotive Instrumentation, Hybrid and Electric Vehicles and Integration and Storage of Electrical Energy in Automotive Systems.

COMPETENCIES/LEARNING OUTCOMES FOR THE SUBJECT

Competencies:
· Knowledge and use of the principles of electromagnetism and circuit theory.

Learning outcomes. Students will:
· Apply knowledge of the fundamentals of electromagnetism, circuits and electricity in situations specific to the industrial field and in the subsequent learning of advanced theories.
· Solve the problems of the subject, through qualitative and quantitative analysis, the approach of hypotheses and the proposal of solutions, using the appropriate electrical models.
· Prepare written and oral works and reports adequately expressing theoretical knowledge, methods of resolution and results, using the vocabulary, forms of representation and specific terminology of Electricity.
· Formulate ideas, debates proposals and make decisions in cooperative work.
· Show a critical spirit and interest in learning.
· Develop designs and projects.
· Apply mandatory legislation, specifications, regulations and standards.
· Analyse and assess the social and environmental impact of technical solutions by applying sustainability criteria.
· Apply quality principles and methods.

Theoretical and Practical Content

Topic 1. Introduction to circuit theory
· Variables and elements of electrical circuits
· Kirchhoff's Laws and Ohm's Law
· Power and energy. Power balance
· Transient state
· Methods and theorems for solving circuits in steady state

Topic 2. Alternating current circuits
· Phasor analysis
· Behaviour of passive components in alternating current
· Resolution of circuits in sinusoidal steady state
· Active, Reactive and Apparent Power. Complex Power
· Reactive power compensation. Billing
· Harmonic distortion

Topic 3. Three-phase circuits
· Description of three-phase systems
· Resolution of three-phase circuits
· Calculation and measurement of power in three-phase systems

Topic 4. Electromagnetism
· Magnetomotive force, field and magnetic flux
· Reluctance. Hopkinson's Law. Magnetic circuits
· Self-induction coefficient of a coil
· Coupled coils

TEACHING METHODS

The subject is taught following a mixed methodology, both with master classes and active methodologies designed to

stimulate student participation, initiative, collaborative work, debate and critical analysis. The students will apply the knowledge acquired in the master classes through the activities proposed in the classroom and in the laboratory.
The 4 sections of the syllabus will be performed through the following teaching tools:
· Application exercises to be done during class time.
· Collection of exercises to do outside class hours.
· Individual questionnaires on the concepts explained in class.
· Assembly of circuits in the laboratory and practice sheets.
· Computer simulations.
· Crossed questions.
· Oral presentations.
Tutorials, both individual and group, are used to resolve doubts, guide work and exercises, propose improvements, etc. In general, tutoring is a voluntary activity at the request of the students.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	30			30					
Horas de Actividad No Presencial del Alumno/a	45			45					

Legend:
M: Lecture-based
S: Seminar
GA: Applied classroom-based groups
GL: Applied laboratory-based groups
GO: Applied computer-based groups
GCL: Applied clinical-based groups
TA: Workshop
TI: Industrial workshop
GCA: Applied fieldwork groups

Assessment methods

- Continuous assessment
- End-of-course assessment

Assessment tools and percentages of final mark

- Exams: 30%
- Continuous assessment: 20%
- Laboratory practices: 30%
- Projects: 10%
- Presentations: 10%

100%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Continuous Assessment System:
The Ordinary Call is evaluated, by default, through the Continuous Assessment System. The mark of the continuous assessment is divided into 3 blocks.
· Block A: Classroom work.
· Block B: Laboratory practices.
· Block C: Deliverable work and presentation.
Assessment block A is made up of 2 partial assessments:
· A1: Corresponds to topic 1.
· A2: Corresponds to the rest of the topics.
Block A is evaluated through written tests (multi-choice questions and exercises on paper and on the computer) and questionnaires (in eGela) and represents 60% of the final mark.
Block B is evaluated with laboratory practices (execution and deliverable sheets) and represents 30% of the mark.
Block C is evaluated based on the delivery and oral presentation of a piece of work. It represents 10% of the final mark.
To pass the subject, it is necessary to pass blocks A and B with a minimum mark of 5. Otherwise, the student will be failed with the weighted average mark limited to a maximum of 4.5.
To pass block A, in addition to obtaining a 5 or more in the weighted average of the partial exams A1 and A2, a minimum mark of 2.5 must be obtained in both partial exams. Should this not be the case, the student will be failed with the weighted average limited to a maximum of 4.5.
The partial assessments and blocks passed during the continuous assessment will be saved during this course.

Final Assessment System:
Students will have the right to be evaluated through a final assessment test, regardless of whether or not they have participated in the continuous assessment system. To exercise this right, the student must submit the opting out to the continuous assessment system in writing to the teaching staff responsible for the subject up to one month before the end date of the teaching period for the subject.

Opting out of ordinary call:
Failure to attend the test set on the official exam date will mean automatic opting out of the ordinary call, which will be marked as "No show".

Non-face-to-face modality due to health issues:
In the event of health issues preventing the carrying out of a teaching activity and/or in-person assessment, a non-face-to-face modality will be activated of which the students will be promptly informed.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Students who do not pass the subject in the ordinary call, regardless of the assessment system chosen, will have the right to take the final test of the extraordinary call.

Opting out of extraordinary call:
Failure to attend the test set on the official exam date will mean automatic waiving the right to the extraordinary call, which will be marked as "No show".

Non-face-to-face modality due to health issues:
In the event of health issues preventing the carrying out of a teaching activity and/or in-person assessment, a non-face-to-face modality will be activated of which the students will be promptly informed.

MANDATORY MATERIALS

Teaching material available on the eGela platform.

BIBLIOGRAPHY

Basic bibliography

Jesús Fraile Mora. *Circuitos eléctricos*. 2ª Edición. Ibergarceta publicaciones, 2019.
Antonio Pastor Gutiérrez y otros. *Circuitos eléctricos* (Vol 1). UNED.
Itziar Zubia Olaskoaga, Elena Monasterio Iruretagoyena, Luis Mª Bandrés Unanue, Puy Arruti Martínez. *Teoría de Circuitos*. UPV/EHU, 2009.
Jesús Fraile Mora. *Máquinas eléctricas*. 6ª Edición Mc Graw Hill.

Detailed bibliography

Félix Redondo Quintela y Roberto C. Redondo Melchor. *Redes eléctricas de Kirchhoff*. 3ª edición. STS Ediciones.
Félix Redondo Quintela. *Redes con excitación sinusoidal*. Ed. REVIDE, S.L. Salamanca, 1997.
Félix Redondo Quintela, Juan Manuel García Arévalo, Roberto C. Redondo Melchor. *Prácticas de Circuitos Eléctricos*. Ed. REVIDE, S.L. Salamanca, 2009.
Puy Arruti Martínez, Elena Monasterio Iruretagoyena, Luis Mª Bandrés Unanue, Itziar Zubia Olaskoaga. *Teoría de Circuitos. Ampliación*. UPV/EHU, 2009.
Steven T. Karris, *Circuit Analysis I with MATLAB® Computing and Simulink® / SimPowerSystems® Modeling*. Orchard Publications, Fremont, California. 2009.
UNE-EN IEC 60375:2018. "Convenios relativos a los circuitos eléctricos y magnéticos".

Journals

IEEE Transactions on Circuits and Systems (www.ieee-cas.org)
International Journal of Circuit Theory and Applications

Web sites of interest

Mathworks (matlab):
https://es.mathworks.com/
GNU/Octave:
https://octave.org/
Jupyter:
https://jupyter.org/
Openmodelica:
https://openmodelica.org/
Circutor:
https://circutor.com/
Som energia:
https://www.somenergia.coop/es/
Iberdrola (información sobre energía reactiva):
https://www.iberdrola.es/comunidades/informacion/energia-reactiva
Redeia - red eléctrica:
https://www.ree.es/es/
Fundamentos de Ingeniería Eléctrica, Canal UNED:
https://canal.uned.es/series/5a6f4e5db1111fa3378b4569

OBSERVATIONS

Universidad del País Vasco — Euskal Herriko Unibertsitatea

COURSE GUIDE 2024/25

Faculty 163 - Faculty of Engineering - Vitoria-Gasteiz **Cycle** .

Degree GIMADE10 - Doble Grado en Ingeniería Mecánica y en Administración y Direc **Year** Third year

COURSE

25981 - Industrial Electronics **Credits, ECTS:** 6

COURSE DESCRIPTION

It is undeniable that electronics currently performs a wide variety of tasks. Today, the main uses of electronic circuits are control, processing, information distribution, and the conversion and distribution of electrical energy. Electronic technology is present in many fields such as domestic, industrial, civil, military, transportation, entertainment, communications, etc.

It is therefore evident that any engineer needs to know the basics and fundamentals of this technology, the components, the circuits, and the basic applications of this subject. Basic knowledge of Electricity (fundamental circuit laws and theorems) is required to take this course. On the other hand, it "opens the door" to all the specific subjects of the Electronics specialty that are taken in the 3rd year.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

Specific Skill (CRI5): Knowledge of the fundamentals of electronics.

Description of Contents: Fundamentals of analog and digital electronics. Components.

Objectives:

LEARNING OUTCOMES

ACQUIRE AND DEVELOP FUNDAMENTAL KNOWLEDGE OF ELECTRONICS IN THE FIELD OF ENGINEERING.

APPLY BASIC KNOWLEDGE OF ELECTRONICS COHERENTLY TO VARIOUS FIELDS OF ACTION, PROPOSING THE MOST SUITABLE SOLUTIONS.

WORK ON THE INHERENT KNOWLEDGE OF THE SUBJECT FOR THE CORRECT APPLICATION OF ELECTRONIC DEVICES, USING SPECIFIC VOCABULARY AND TERMINOLOGY.

ADOPT A SPIRIT OF IMPROVEMENT TOWARDS LEARNING AND APPLICATIONS OF THE SUBJECT.

Theoretical and Practical Contents

Introduction to General Electronics. Electronic Systems. Areas of Specialization in Electronics. Detailed Vision, System Vision. Fundamental Quantities. Signals and Waves. Basic Functions. Applications.

Diodes and Diode Circuits. The Ideal Diode and the Real Diode. Characteristics. Regions of Forward Bias, Reverse Bias, and Zener. Other Diodes: Zener, LEDs. Analysis of Circuits with Diodes. Models. Applications of Circuits with Diodes, Rectifiers, and Clippers.

The Bipolar Transistor. Definitions. Operating Regions of BJTs. Characteristic Curves. DC Analysis.
JFET and MOSFET Transistors. Definitions. Operating Regions of JFETs and MOSFETs. Characteristic Curves. DC Analysis.

Transistor Biasing Circuits. Calculation of Operating Points. Biasing Networks.

Ideal Operational Amplifiers. Linear and Nonlinear Operation. Input Impedance, Output Impedance, and Gain.

Introduction to Digital Electronics. Binary System. Numeric Codes. Boolean Algebra. Elementary Logical Functions. Combinational Circuits. Sequential Circuits.

TEACHING METHODS

Lectures will include abundant problem-solving sessions and practical exercises.

There will be six laboratory sessions where students will learn to use and operate basic electronic laboratory equipment and will assemble and test various fundamental electronic circuits.

Attendance to laboratory sessions is mandatory. In the event that a student is unable to attend or complete any of the sessions, in order to pass the course, after passing the theoretical exam, they must undergo and pass a laboratory practical exam.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	45			15					
Horas de Actividad No Presencial del Alumno/a	67,5			22,5					

Legend: M: Lecture-based | S: Seminar | GA: Applied classroom-based groups | GL: Applied laboratory-based groups | GO: Applied computer-based groups | GCL: Applied clinical-based groups | TA: Workshop | TI: Industrial workshop | GCA: Applied fieldwork groups

Evaluation methods

- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 90%
- Exercises, cases or problem sets 10%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The course will consist of both theoretical and practical assessments of the knowledge acquired during the course.

The Theory part (final written exam) will account for 90% of the total grade, and the Laboratory Practices part (lab exam) will account for the remaining 10%. To pass the course, it will be necessary to obtain a grade of 5 in both the theory exam and the practical evaluation. (Therefore, theory and practicals of the subject must be passed separately).

The final written exam will consist of two parts: analog electronics section (6 points out of 10) and digital electronics section (4 points out of 10). The exam will mainly focus on problem-solving, where both the final result and the method used to obtain it will be evaluated.

Regarding laboratory practices, proficiency in handling basic equipment and instruments, appropriate resolution of proposed circuits, and attitude towards the practices will be assessed and valued.

If a student fails the laboratory practices, after passing the theoretical exam, they must undergo and pass a practical exam.

To withdraw from the exam, simply not attending will suffice.

Once the student has started the exam, they must submit it even if it remains blank, and it will count as an attempt.

In case sanitary conditions prevent the realization of face-to-face teaching and/or evaluation activities, a non-presential modality will be activated, of which students will be promptly informed.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The assessment will consist of a theoretical evaluation only if laboratory practices have been passed in the regular session (written lab exam). Similarly, it will consist only of a written lab exam if the theoretical exam has been passed during the regular session.

The Theory part (final written exam) will account for 100% of the total grade. The final written exam will consist of two parts: analog electronics section (6 points out of 10) and digital electronics section (4 points out of 10). The exam will primarily focus on problem-solving, where both the final result and the method used to obtain it will be evaluated.

Regarding laboratory practices, they must have been passed during the corresponding regular semester, where proficiency in handling basic equipment and instruments, appropriate resolution of proposed circuits, and attitude towards the practices will be assessed.

In case laboratory practices have not been passed or completed, once the theoretical exam of the subject has been passed in the extraordinary session, a lab practical exam will be conducted, which must be passed to pass the subject as a whole.

To withdraw from the exam, simply not attending will suffice. Once the student has started the exam, they must submit it even if it remains blank, and it will count as an attempt.

In case sanitary conditions prevent the realization of face-to-face teaching and/or evaluation activities, a non-presential modality will be activated, of which students will be promptly informed.

MANDATORY MATERIALS

Material available on e-gela.

BIBLIOGRAPHY

Basic bibliography

Análisis Básico de Circuitos Eléctricos y Electrónicos. Varios aut. Edit Pearson Prentice Hall
Principios de Electrónica.Malvino. Edit Mc Graw Hill.
Problemas de Electrónica. Varios aut. Edit Marcombo

Detailed bibliography

Electrónica.Hambley.Edit Prentice Hall
Componentes electrónicos. Espinosa y otros. Edit Universidad de Alcalá.
Principios fundamentales de electrónica. Alcalde. Edit Paraninfo.
Circuitos microelectrónicos. M.Rashid. Edit Thomson.
Problemas de Electrónica Básica. J.Maté y otros. Edit Universidad de Valladolid.
Electrónica. Storey Edit Addison-Wesley Iberoamericana.
Electrónica analógica para ingenieros. Pleite. Edit Mc Graw-Hill
Circuitos Microelectrónicos. Sedra y Smith. Edit Oxford.

Journals

Web sites of interest

http://www.sc.ehu.es/sbweb/electronica/elec_basica/

http://grupos.unican.es/dyvci/ruizrg/html.files/LibroWeb.html

OBSERVATIONS