Universidad del País Vasco Euskal Herriko Unibertsitatea

ENGLISH FRIENDLY COURSES (EFC) 2023-2024
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	➡
28126	Cálculo y Diseño de Estructuras Automovilísticas	1st	6	A	➡
28134	Aerodinámica	1st	6	M	
25996	Sistemas Electrónicos Digitales	2nd	6	M	➡
26006	Ampliación de Informática Industrial	2nd	6	A	➡
26007	Control por Computador	2nd	6	A	➡
28132	Simulación y Análisis FEM en Automoción	2nd	6	A	➡
Bachelor`s Degree in Mechanical Engineering					
26045	Elasticidad y Resistencia de Materiales	1st	9	M	➡
26046	Cinemática y Dinámica de Máquinas	1st	9	M	

[1] SEMESTER: 1st: September 2023 to January 2024
2nd : January 2024 to May 2024
Annual: September 2023 to May 2024

[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
26050	Instalaciones y Máquinas Hidráulicas	2nd	6	M	
Bachelor's Degree in Industrial Chemical Engineering					
26091	Química Industrial	2nd	6	M	
26095	Gestión de residuos industriales	2nd	6	M	
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	
Bachelor's Degree in Computer Management and Information Systems Engineering					
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	
26036	Desarrollo de Sistemas Gráficos	1st	4,5	A	
26006	Ampliación de Informática Industrial	2nd	6	A	
26013	Metodología de la Programación	2nd	6	M	
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	

English Friendly Courses taught in BASQUE:

FACULTY OF ENGINEERING - VITORIA-GASTEIZ (163)					
	COURSE	SEMESTER[3]	CREDITS	SCHEDULE[4]	LINK TO SYLLABUS
Bachelor's Degree in Automotive Engineering					
28140	Ibilgailu Elektrikoak eta Hibridoak	1st	6	M	
28122	Mekanikaren Oinarriak	2nd	6	M	⇨

[3] SEMESTER: 1st: September 2023 to January 2024
2nd : January 2024 to May 2024
Annual: September 2023 to May 2024

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

COURSE GUIDE 2023/24

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).

CONTENIDOS TEÓRICO-PRÁCTICOS

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 (BlackBoard Collaborate, 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.

BIBLIOGRAFÍA

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.

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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.

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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

COURSE GUIDE 2023/24

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

CONTENIDOS TEÓRICO-PRÁCTICOS

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

BIBLIOGRAFÍA

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.

COURSE GUIDE 2023/24

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

Degree GIEIAU10 - Bachelor's Degree in Industrial Electronics and Automation Engine **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. Mass geometry. Static
2) Kinematics.
3) 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.
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

- GONZALO, G.C. Problemas para un curso de mecánica. Edit: UPV-EHU.
- 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
- Joseba García Melero. Resistencia de Materiales. Editorial: UPV-EHU

Detailed bibliography

- BILBAO, A; AMEZUA, E. Mecánica Aplicada: Estática y cinemática. Edit: Síntesis.
- 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

COURSE GUIDE 2023/24

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

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

COURSE

25985 - Production and Manufacturing Systems **Credits, ECTS:** 6

COURSE DESCRIPTION

DESCRIPCIÓN:
Partiendo del diseño del producto y del conocimiento de los materiales, la asignatura Sistemas de Producción y Fabricación establece los fundamentos del conocimiento y la aplicación de los procesos de conformación metal–mecánica en una secuencia lógica de acuerdo a su ubicación en el contexto productivo. De ahí el carácter multidisciplinar de la asignatura, y el gran número de interrelaciones con otros campos o áreas de conocimiento.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

Técnicas, equipos y procesos de producción. Sistemas de fabricación flexible

Theoretical and Practical Contents

Descripción de procesos productivos Máquina-herramienta, conformado plástico, fundición, soldadura y otros
Diseño de procesos de producción
Distribución en planta
Gestión de stocks de demanda independiente
Planificación de ventas y operaciones
Programación maestra de la producción (MPS - Master Production Scheduling)
MRP (Material Requirements Planning)
Planificación de la capacidad
Programación de la producción - Operations Scheduling
JIT - Just in Time
T.O.C. Teoría de las limitaciones
Gestión de proyectos: PERT, CPM

TEACHING METHODS

Las clases MAGISTRALES servirán para exponer los fundamentos teóricos de los procesos de fabricación y de aquellas materias que están íntimamente ligadas al desarrollo y control de los mismos, tratando de describir las múltiples relaciones existentes con otras disciplinas y con la aplicación de los conocimientos que se adquirirán en otras especialidades de la Ingeniería.

Asimismo, se propondrá la realización de ejercicios o problemas que se recogerán en clase. Los ejercicios se entregarán individualmente.

Además, se propondrán trabajos. Éstos se realizarán preferentemente en parejas y se expondrán en las últimas semanas de clase de la asignatura.

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 70%
- Exercises, cases or problem sets 15%
- Oral presentation of assigned tasks, Reading¿ 15%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

- EXÁMENES 80%
- ENTREGABLES (CUESTIONES, PROBLEMAS, TRABAJOS...) 20%

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

En segunda convocatoria se realizará una única prueba o examen final (prueba escrita) en el que se contemplarán todos los contenidos desarrollados durante la asignatura.
Si el estudiante no se presenta al examen de la convocatoria EXTRAORDINARIA (junio/julio), obtendrá un "No presentado" independientemente de su participación en la realización de prácticas o en la exposición de trabajos.

MANDATORY MATERIALS

Apuntes y documentación proporcionada por el profesorado de la asignatura.

BIBLIOGRAPHY

Basic bibliography

Diseño de Procesos de Producción y distribución en planta:
Suñe, A., Gil, F. y Arcusa, I. (2005) Manual práctico de diseño de sistemas productivos. Díaz de Santos.
Alarcón Valero y otros. (2004) Diseño de sistemas productivos y Logísticos. Universidad Politécnica de Valencia.
Cuatrecasas, Ll., (1998). Gestión competitiva de stocks y procesos de producción. Gestión 2000.
Cuatrecasas, LL (2000). Diseño de procesos de producción flexible. TGP.

Gestión de stocks:
Fernández, M. Planificación y gestión de la producción. ICAI
Krajewski, L.; Ritzman, L. (2000) Administración de operaciones. Estrategia y análisis. Prentice Hall.
Schroeder, Roger. (2005) Administración de operaciones. Concepto y casos contemporáneos. McGrawHill.

Planificación de Ventas y Operaciones:
Vollmann, T. y otros. (2005) Planeación y control de la producción. Administración de la cadena de suministros. McGrawHill.

Plan Maestro de Producción:
Krajewski, L.; Ritzman, L. (2000) Administración de operaciones. Estrategia y análisis. Prentice Hall.

MRP y MRP II:
Cuatrecasas, Ll., (1998). Gestión competitiva de stocks y procesos de producción. Gestión 2000.
Vollmann, T. y otros. (2005) Planeación y control de la producción. Administración de la cadena de suministros. McGrawHill.

JIT:
Marin, F: Delgado, J. (2000). Las técnicas justo a tiempo y su repercusión en los sistemas de producción. Revista Economía Industrial. Nº 331

Programación y control producción:
Alfaro, J.; Pérez, D.; García, J.; Andrés, C.; Lario, F.C. (2002). Problemas de programación y control de producción. Universidad Politécnica de Valencia.
Andrés, C. y otros. Apuntes de programación y control de producción

Detailed bibliography

Journals

Web sites of interest

http://ekasi.ehu.es/
http://moodle.ehu.es/moodle/

OBSERVATIONS

COURSE GUIDE 2023/24

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 Electronics Systems is a 3th year compulsory subject aiming at introducing the design of 8-bit microcontrollers systems their most common peripherals and protocols.
The referred devices are in the core of almost any electronic equipment manufactured today which portrays its practical utility.
It is convenient to have developed the competencies acquired in Digital Electronics and Informatics Fundamentals to successfully face this subject, which, in turn, is the starting point for the following subjects: Embedded Systems and Microelectronics.

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
Mastering the use of tools and development environments for microcontroller based designs.
Capability to integrate information from professional sources in other languages
Capability to mount and solder a PCB interpreting its schematics

Theoretical and Practical Contents

8051 based architecture
Data and code memory
Interrupts and integrated peripherals
8051 assembly language
Asynchronous communications: RS-232 and RS-485
Synchronous protocols: I2C and SPI
I/O peripherals: LCDs, Key arrays
Voltage supervisor and watchdogs
Other architectures
The following demonstrations will be carried out
-IDE and code generation
-Simulation/debugging
-Functions and loops
-GPIO’s
-Audio generation
-Stepper motor
-Serial port
-Alphanumeric LCD
-I2C LED driver
-4x4 key array read
-IDEs for other architectures

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. Tests will have to be taken about the contents of the first 5 subjects.
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. Attendance is compulsory.
The student should be able to handle different bibliographic resources and datasheets from manufacturers.

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 70%
- Individual assignments 30%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Mounting a working microcontroller based PCB is compulsory to be evaluated.
The assessment work will be presented to the professor who will evaluate the specifications fulfillment (25%), the right use of the explained methodologies (10%), the grade of self-development (15 %) and the exposition (10 %). The assessment can be carried out from the 11th week.
Tests (40 %) will be carried out before starting with the microcontroller project. The mark obtained in this case will be the average of the tests marks.
In order to renounce this call the student only needs not to hand in the expected microcontroller 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 University regulations.
If any of the proposed activities cannot be performed for whatever reason, equivalente alternative activities will be scheduled and published

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Firts call rules apply for the second call.

MANDATORY MATERIALS

Micrcontroller based PCB and related IDEs and compilers.

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

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.

COURSE GUIDE 2023/24

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.

COURSE GUIDE 2023/24

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 optional subject of 4th course "Expansion of Industrial Informatics" can be taken from two degrees:
- Degree in Computer Engineering of Management and Information Systems
- Degree in Automatic and Industrial Electronic Engineering

Therefore, it is taken for granted that the capacities and knowledge of the students at the beginning of course will be very different.

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

Given its terminal nature of the subject, a practical and updated approach will be given to the subject, without losing the rigor in the treatment of content.

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

· Pyramid of Automation
· Industry 4.0
· Advanced aspects in PLC programming
· Industrial Communications. Communications between PLCs.
· Services and technologies.

TEACHING METHODS

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

· The theoretical topics of the subject will be exposed.
· The practical topics will be presented in class and then exercises will be carried out on them. For some of these works the students must be able to search for additional information.

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%
- Tests on other theoretical and / or practical work: 20%

According to the Regulations governing the Evaluation of Students in official Bachelor's 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 system continuous evaluation. To do this, students must submit in writing to the teaching staff responsible for the subject the waiver of continuous assessment. The students will have a period of 9 weeks from the beginning of the subject, in accordance with the academic calendar of the center.

If a student wishes to waive the Ordinary Call, he may do so by writing to the teaching staff of the subject in the dates designed by the normative.

If there is a final written test, a minimum qualification of 4/10 must be obtained in order to pass the subject.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The same criteria will be used as in the Ordinary Call. In this sense, the necessary tests will be carried out to ensure an adequate evaluation of the subject.
If applicable, the qualifications corresponding to the continuous evaluation of the subject may be kept.

MANDATORY MATERIALS

The teaching materials will be made available to through the e-gela platform or the teacher's website.

BIBLIOGRAPHY

Basic bibliography

The manuals and examples provided by the manufacturers of the automata will be used.

Detailed bibliography

If necessary, additional in-depth bibliography as well as on-line references will be provided during the development of the subject.

Journals

If necessary, additional in-depth bibliography as well as on-line references will be provided during the development of the subject.

Web sites of interest

If necessary, additional in-depth bibliography as well as on-line references will be provided during the development of the subject.

OBSERVATIONS

COURSE GUIDE 2023/24

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

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

COURSE

26007 - Intelligent Control **Credits, ECTS:** 6

COURSE DESCRIPTION

SHORT DESCRIPTION
This subject is aimed at designing and implementing computer based control systems for different applications in engineering. Consequently, the students should learn: (1) the role of computers in modern control systems; (3) modeling discrete systems and signals; (4) analyze the stability of the systems; (5) design computer control based systems and (6) discretize existing continuous systems.

SUBJECT DESCRIPTORS
Control Theory and Feedback; Computer role in control systems; Signals and Systems; Discrete systems; Modeling; Dynamics and Stability; Cyber-Physical Systems (CPS)

PREVIOUS REQUIREMENTS
This subject is aimed at students from two different engineering degrees, namely (1) Industrial Electronics and Automatic Control and (2) Computer Management and Information Systems.

Some students may come from the degree at Computer Management and Information Systems, consequently they are not required to have previous knowledge in Control Theory. These students have a sound background in computers and programming algorithms which are basic tools for implementing complex computer control systems. On the contrary, students coming from the Industrial Electronics and Automatic Control degree are already familiar with the basic concepts of control theory but are less familiar with computers and programming tools. The combination of different kinds of students will produce multidisciplinary working groups which is a basic learning competence.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

Computer control will develop different competences and producing the following learning outcomes:

BASIC COMPETENCES
1. Acquire knowledge about basic and technological matters
2. Learn new methods and versatility to adapt to new situations
3. Solve problems with initiative and creativity, providing innovative solutions
4. Communicate and transmit knowledge in the Electronics & Computing domains
5. Working in a multilingual and multidomain environments.
6. Apply the scientific methodology strategies:
   a) Analyze problems and situations
   b) Make hypothesis
   c) Find solutions
7. Working both autonomously and in groups

LEARNING OUTCOME
1. Learning the role of the computers in modern control systems
2. Learning the basics of dealing with signals
3. Understanding the basics of sampling and reconstruction of signals with computers
4. Ability of modeling discrete systems and signals
5. Capability for analyzing the stability of systems
6. Capability for designing simple computer based systems
7. Techniques for discretizing continuous systems

Theoretical and Practical Contents

CONTENTS:
1. Basic introduction to control
2. The role of the computer in control
3. Discrete signals:
   a) Mathematical representation of signals
   b) Signal sampling and reconstruction (Zero Order Holders, ZOH)
4. Discrete systems:
   a) Modelling of discrete systems (Difference equations / The Z transform / Block diagrams)
   b) Transient vs. steady state response analysis

c) Relationship between Laplace and Z transforms
d) Composing complex systems - Algebra of blocks
5. Stability analysis of discrete systems
6. Design of discrete control systems
a) Discretisation of continuous controllers
b) Digital Direct Control

NOTE:
These topics will be developed both in the classroom and in the laboratory.

TEACHING METHODS

CLASSROOM
1. Lectures will be used to explain the major concepts of this module.
2. Some collaborative activities will be included and the deliverables will be required. These deliverables will be used in the qualification of the students.

LABORATORY
1. Some exercises will be proposed to be solved by the students.
2. The students will have to create a short project where they must apply the concepts learnt during this module.

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

- Individual assignments 10%
- Teamwork assignments (problem solving, Project design) 30%
- Oral presentation of assigned tasks, Reading¿ 10%
- Portfolio 50%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

A. CONTINUOUS ASSESMENT of the tasks:
1. Portfolio of the tasks proposed during the laboratory sessions (30%)
Reports of the Matlab exercises proposed in the lab.
2. Realization of a proposed miniproject related with the concepts learnt in the classroom (50%)
3. Presentation of the miniproject (10%)
4. Realization of other individual tasks (10%)

NOTES FOR THE CONTINUOUS ASSESMENT:
Students will be qualified as NON-PRESENTED when they do not completed the amount of the 55% of the total final assignments.

The deliverables associated to these tasks SHOULD be submitted by means of eGela.

B. ALTERNATIVE FINAL EXAM (100%)
The alternative final exam may include two parts, one written part with some questions and problems related to the syllabus of the module and another part in the laboratory where the students should solve some exercises with Matlab.

C. RENOUNCE PROCEDURE
Students will automatically renounce to the module when they do not present in time the 55 % of the proposed tasks of the module. In case these students want to pass the module, they should do the alternative final exam.

All students may renounce to present to the final exam by communicating it to the lecturer at least 15 days in advance.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

EXTRAORDINARY FINAL EXAM (100%)
The extraordinary final exam may include two parts, one written part with some questions and problems related to the syllabus of the module and another part in the laboratory where the students should solve some exercises with Matlab.

All students may renounce to present to the final exam by communicating it to the lecturer at least 15 days in advance.

MANDATORY MATERIALS

Matlab, Arduino

BIBLIOGRAPHY

Basic bibliography

1. K. Ogata, Discrete-Time Control Systems, 2nd Ed., Prentice-Hall, 1995.
2. R.C. Dorf, R.H. Bishop, Modern Control Systems 12th Ed., Pearson, 2010.
3. eGela: [https://egela.ehu.es/]
4. Tutorial on Matlab and control: [http://ctms.engin.umich.edu/CTMS/]

Detailed bibliography

1. C.L. Philips, H.T. Nagle, Digital control systems. Analysis and Design, Prentice-Hall, 1995
2. R. G. Jacquot, Modern Digital Control Systems, Marcel Dekker, Inc.,1984.
3. K.J. Astrom, R.M. Murray, Feedback Systems, Princeton University Press, 2009.
4. K.J. Astrom and B. Wittenmark, Computer Controlled Systems, Prentice Hall. 1992
5. Franklin, G. F., Powel, J.D. and Workman M.L., Digital control of Dynamic Systems, 2nd Ed. Addison Wesley.1992
6. E.A. Lee, S.A. Seshia, Introduction to Embedded Systems. A Cyber-Physical Approach, UC Berkeley, 2012. Available at: [http://leeseshia.org/releases/LeeSeshia_DigitalV1_50.pdf]

Journals

Automática (Elsevier)
International Journal of Control
Control System Magazine (IEEE)

Web sites of interest

1. eGela: [https://egela.ehu.es/]
2. Tutorial on Matlab and control: [http://ctms.engin.umich.edu/CTMS/]

OBSERVATIONS

COURSE GUIDE 2023/24

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

Degree GIIGSI10 - Bachelor's Degree in Computer Engineering in Management and In **Year** First year

COURSE

26013 - Methodology of Programming **Credits, ECTS:** 6

COURSE DESCRIPTION

The subject of Programming Methodology introduces the student to the field of formal software development. In this subject, which is taught after Basic Programming, the basic concepts necessary to create and execute computer programs will be introduced, emphasizing formal specification methods.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

- Capacity to analyse, design, construct and maintain applications in a robust and secure manner
- Capacity to specify, document, validate and verify programs
- Capacity to reason and justify properties related to programs
- Capacity to evaluate and compare specifications and documentation of programs from the quality point of view
- Knowledge of formal specification and program design methods
- Knowledge of basic notions of axiomatic semantics of programming languages
- Knowledge and application of basic algorithmic procedures of IT technologies for the design of solutions to problems, analysing the suitability and complexity of the algorithms proposed

Specific objectives:
- Specification, correction and design by contract
- Formal pre-post specification
- Hoare’s formal system
- The equational specification technique
- The formal derivation method

CONTENIDOS TEÓRICO-PRÁCTICOS

- Topic 0: Introduction
- Topic 1: Logical Assertions
- Topic 2: Specification
- Topic 3: Verification
- Topic 4: Derivation

TEACHING METHODS

In the lectures there will be sessions of concepts exposition, reinforced with examples of situations in which these concepts are to be used.

In the practical part a set of exercises will be developed. The exercises to be carried out pose programming problems that students must perform in the most autonomous way as possible.

During the lectures group work will be carried out systematically, discussing and presenting the results of exercises with the aim of encouraging direct participation in the course and also students' motivation.

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 100%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Assessment of the subject in the ordinary call is either done through continuous assessment or final assessment. By default, all students will do continuous assessment, unless they withdraw from it.

* Evaluation with final exam
It is allowed to withdraw from continuous assessment to take a single final exam. This withdrawal must be communicated the professor responsible for the course in the period set out in Article 8 of the Rules for Student Assessment.
Withdrawals from continuous assessment will not be accepted after the dates stated, except in exceptional cases.

The exam will test the entire content of the subject. To pass the subject, it is necessary to obtain a minimum mark of 5 out of 10 in the exam.

* Continuous assessment
By default, continuous assessment is the standard method, unless the student has expressly withdrawn from it.

Continuous assessment is done through written tests to demonstrate that knowledge and competences taught in the subject have been acquired.

1) First-order logic (20% of the grade)
2) Sequences and conditionals (20% of the grade)
3) Iterations (30% of the grade)
4) Recursiveness and function calls (30% of the grade)

* Requirements to pass the ordinary call through continuous evaluation without final exam
- Perform all written tests
- Minimum score of 5 in the sum of all the tests
- Minimum score of 25% on each of the tests

* Ordinary final exam:
The only students who can present themselves are those who have passed at least three written tests, although they may not have reached the level required to pass an ordinary call in continuous assessment.

The exam will be divided into four parts, corresponding to each test:
The student may take the parts he/she wishes
The grades from previous tests will be maintained if they are not taken in this exam
The grade of previously taken tests will not be maintained (corresponding to the parts taken in this exam) for the purposes of the calculation of the final grade

* Requirements to pass the ordinary call:
- Have taken all the written tests (in the ordinary final exam or before)
- Minimum mark of 5 in the sum of all the written tests
- Minimum mark of 25% in each written test

* Withdrawal from the exam:
Students following continuous assessment may withdraw from the call as per that stated in Article 12 of the Rules for Student Assessment

* Cases of copying:
Article 11 of the Rules for Student Assessment will be applied.

* Continuous assessment
By default, continuous assessment is the standard method, unless the student has expressly withdrawn from it.
Continuous assessment is done through written tests, in which students must demonstrate that they have acquired the knowledge and competences taught in the subject.
1) First-order logic (20% of the grade)
2) Sequences and conditionals (20% of the grade)
3) Iterations (30% of the grade)
4) Recursiveness and function calls (30% of the grade)

* Requirements to pass the ordinary call through continuous evaluation without final exam
- Perform all written tests
- Minimum score of 5 in the sum of all the tests
- Minimum score of 25% on each of the tests

* Ordinary final exam:
The only students who can present themselves are those who have passed at least three written tests, although they may not have reached the level required to pass an ordinary call in continuous assessment.

The exam will be divided into four parts, corresponding to each test:
The student may take the parts he/she wishes
The grades from previous tests will be maintained if they are not taken in this exam
The grade of previously taken tests will not be maintained (corresponding to the parts taken in this exam) for the purposes of the calculation of the final grade

* Requirements to pass the ordinary call:
Have taken all the written tests (in the ordinary final exam or before)
Minimum mark of 5 in the sum of all the written tests
Minimum mark of 25% in each written test

* Withdrawal from the exam:
Students following continuous assessment may withdraw from the call as per that stated in Article 12 of the Rules for Student Assessment

* Cases of copying:
Article 11 of the Rules for Student Assessment will be applied.

* 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

The extraordinary call consists of an exam on 10 points in which the whole of the subject is evaluated.

To pass the subject, it is necessary to obtain a minimum score of 5 points out of the total of 10 exam points.

To waive the right to the examination, it will be sufficient not to appear. In this case, the qualification will be "No Presented".

* Note that no grade from the ordinary call is kept

* Cases of copying
Article 11 of the Rules for Student Assessment will be applied.

MANDATORY MATERIALS

- Material of the subject (Notes and Laboratories)
- eGela virtual platform of the UPV/EHU for this subject

BIBLIOGRAFÍA

Basic bibliography

- Especificación, Verificación y Derivación Formal de Programas. J. Álvez, X. Arregi, J. Gaintzarain, P. Lucio y M. Marichalar, Pearson, 2016.
- Programen Egiaztapena eta Eratorpena. X. Arregi, A. Díaz de Ilaraza, P. Lucio. Udako euskal Unibersitatea, 1993.
- Metodología y Tecnología de la Programación II. M. Díaz Roca, J. C. Rodríguez del Pino. Univ. Palmas Gran Canaria, 2004.
- Verificación de Programas y Metodología de la Programación. A. Díaz de Ilarraza, P. Lucio. Servicio Editorial Universidad del País Vasco, 1990.
- Program Derivation. The Development of Programs from Specifications. G. Dromey. Addison-Wesley, 1989.

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- Program Construction and Verification. R. C. Backhouse. Prentice-Hall, 1986.
- Programación metódica. J.L. Balcázar. MacGraw-Hill, 1993.
- Diseño de Programas.- Formalismo y Abstracción. Ricardo Peña. Prentice Hall, 1998.

Journals

- Acta Informatica
- Programming and Computer Software

- Science of Computer Programming
- Software Quality Journal
- Transactions on Software Engineering and Methodology

Web sites of interest

- http://www.sc.ehu.es/jiwlucap/metodologia.html
- http://en.wikipedia.org/wiki/Formal_verification
- http://en.wikipedia.org/wiki/Design_by_contract

OBSERVATIONS

COURSE GUIDE 2023/24

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

CONTENIDOS TEÓRICO-PRÁCTICOS

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.

BIBLIOGRAFÍA

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.

COURSE GUIDE 2023/24

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.

CONTENIDOS TEÓRICO-PRÁCTICOS

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

At least 5 points out of 10 must be scored to pass the subject course.
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.

BIBLIOGRAFÍA

Basic bibliography

Ramón F. BRENA; "Autómatas y Lenguajes. Un enfoque de diseño", Tec de Monterrey, 2003.

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

Java Computability Tool kit (JCT): http://humboldt.sunyit.edu/jct/
Visual and interctive tools (JFLAP): http://www.jflap.org/
Machine Learning theory and examples: http://www.cs.cmu.edu/~avrim/ML07/index.html
Implementación de algoritmos de IA en Java: https://github.com/aima-java/aima-java

OBSERVATIONS

COURSE GUIDE 2023/24

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.- 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).

CONTENIDOS TEÓRICO-PRÁCTICOS

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.

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.

NOTE: In case that the lessons and/or exams could not be done face-to-face, alternative options will be set up in order to replace them by on-line activities, making use of the tools provided by the university. The characteristics of the on-line evaluation will be published in the virtual classroom and in an ammendement of the academic guide.

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:
- Students's regulation: https://www.ehu.eus/documents/3026289/3106907/Reglamento_Alumnado_UPV_EHU.pdf
- Regulation for students' evaluation: https://www.ehu.eus/es/web/estudiosdegrado-gradukoikasketak/ebaluaziorako-arautegia
- Code of ethics: https://www.ehu.eus/documents/2100129/0/6.-+b%29+Protocolo+plagio+cas+-.pdf/11f13960-d46a-cf5a-ac13-ebfb5ad10acd

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.

NOTE: In case that the lessons and/or exams could not be done face-to-face, alternative options will be set up in order to replace them by on-line activities by means of the tools provided by the university. The characteristics of the on-line ebaluation will be published in the virtual classroom and in an ammendement of the academic guide.

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.

NOTE: In case that the lessons and/or exams could not be done face-to-face, alternative options will be set up in order to replace them by on-line activities by means of the tools provided by the university. The characteristics of the on-line evaluation will be published in the virtual classroom and in an ammendement of the academic guide.

MANDATORY MATERIALS

Materials in the virtual classroom.

BIBLIOGRAFÍA

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

COURSE GUIDE 2023/24

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 (Data Protection Act, 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: Data Protection Act, 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

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

Beyond Fear. B. Schneier, "Beyond Fear: Thinking Sensibly About Security in an Uncertain World", Springer, 2006.

Emilio del Perso et al, "Nuevo Reglamento de Protección de Datos de Carácter Personal. Díaz de Santos, 2008.

Journals

Auditoría + Seguridad informática

IEEE Security & Privacy

Web sites of interest

https://www.incibe.es/
http://www.criptored.upm.es/
http://www.intypedia.com/
http://www.rediris.es/
http://www.avpd.euskadi.eus
http://www.agpd.es/

OBSERVATIONS

COURSE GUIDE 2023/24

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 re:
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

CONTENIDOS TEÓRICO-PRÁCTICOS

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 laboratory, a series of (previously-distributed) exercises will be worked on. The sessions require prior preparation and the presentation of a report using the problem-solving methodology given. A project will also be created, in which the student will put the concepts worked on in the subject into practice.

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

- Written test, open questions 55%
- Exercises, cases or problem sets 45%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Assessment in the ORDINARY call will be done under continuous assessment or final assessment. By defect, 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 work (15%).

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 3.5 out of 10 in the grade corresponding to the exams in which the practical and laboratory work is included. 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
Article 11 of the current rules on student assessment will be applied.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Assessment in the EXTRAORDINARY call will consist of three parts:

In the extraordinary call, the students may recover the parts corresponding to practical work and laboratory work by answering some specific questionnaires.
If they have passes all these parts, they may maintain the grade obtained in the ordinary call.

Students who have withdrawn from continuous assessment will have a single final exam in which the aspects worked on in class, the laboratories and practical sessions will be assessed.

To withdraw from this exam, it is sufficient not to appear on the day.

MANDATORY MATERIALS

Course material in egela

BIBLIOGRAFÍA

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.

Detailed bibliography

"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

COURSE GUIDE 2023/24

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

Degree GIIGSI10 - Bachelor's Degree in Computer Engineering in Management and In **Year** Fourth year

COURSE

26036 - Development of Graphic Systems **Credits, ECTS:** 4,5

COURSE DESCRIPTION

Real-time graphics applications, especially video games, are one of the most complex software fields, as they require knowledge in various areas of knowledge such as graphic programming, physics, sound, artificial intelligence, etc.
This subject is an introduction to the demanding world of video game that focuses on graphic programming.In addition to learning the specific concepts and techniques of programming, the students will implement in a group project more general concepts and techniques of programming and software engineering acquired in the subjects of Basic Programming, Modular Programming and Object Orientation, Data Structures and Algorithms and Engineering of the Software.
The subject is organized around two larger group projects than those undertaken in previous subjects, in which students will work the different stages of a software project. Due to the entity of these projects, students will face the need to coordinate among several programmers using tools for collaborative development, skill that is essential for the world of work.During the project work, the students will be supervised by the professor but will take the design decisions autonomously, learning both from the correct answers and from the mistakes.
Although the subject does not teach everything necessary to enter directly into a professional video game studio, it provides a first approach to the programming of graphic applications, which is a work area with many outlets in the labor market: programming video games, simulation, image/video processing, architecture, etc.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

Students pursuing this subject will acquire the specific skills listed below. These have been particularized for the subject from the competencies of the module to which it is a part.
-G001 - Ability to develop real-time graphical applications.
-G005 - Ability to conceive, develop and maintain computer systems, services and applications using software engineering methods as an instrument for quality assurance.-G009 - Ability to solve problems with initiative, decision making, autonomy and creativity. Ability to communicate and transmit the knowledge, skills and abilities of the profession of Computer Engineer.
-G012 - Knowledge and application of basic human resources management, project organization and planning.-CB5 - That students have developed the necessary learning skills to undertake further studies with a high degree of autonomy.

Theoretical and Practical Contents

The theoretical content of the subject is structured according to the following theme:
1. Introduction to graphics systems.
1.1. Definitions.
1.2. Basic concepts: application, graphic engine, API, hardware.
1.3. Basic structure of graphic applications.
2. Graphic programming interfaces.
2.1.Graphic programming in two dimensions.
2.1.1. Primitive drawing.
2.1.2. Projection matrices for two-dimensional drawing.
2.1.3. Textures.
2.2. Graphic programming in three dimensions.
2.2.1. Projection matrices for drawing in three dimensions.
2.2.2. Lighting.
3. Applications with graphic interface.
3.1. Introduction.
3.2. Graphics.
3.3. Control and animation.
3.4. [Introduction to collisions and physics].

TEACHING METHODS

The methodology of the subject will rely heavily on the two group projects students will work on. Every week, theoretical concepts will be explained in the theory session and, in the practical session, students will work on the resolution of practical exercises or the group projects.

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

- Multiple choice test 20%
- Teamwork assignments (problem solving, Project design) 80%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The assessment shall be carried out by continuous assessment. During the course, students will work on two group projects. The grade of the first project will account for 30% of the final grade, the second project 50%, and the remaining 20% will be evaluated by individual written tests. The two projects will be evaluated in the same way:
-Group grade (50%)
-Individual grade (20%)
-Individual presentation (20%)
-Cross evaluation (10%)

The student may waive the continuous assessment and request the evaluation by final examination. In this case, subject to compliance with the deadlines laid down by the regulations, the assessment shall be carried out by means of a written examination comprising 100% of the student's note.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

In the special call, the student will perform a written exam which will value 100% of the student's note. This examination will consist of test questions and practical exercises to be resolved.

MANDATORY MATERIALS

All necessary materials will be available in Egela

BIBLIOGRAPHY

Basic bibliography

-Fundamentals of Computer Graphics 3rd Edition, Roger S. Pressman. A K Peters/CRC Press 2009, ISBN 978-1568814698
-Game Engine Architecture, Second Edition, Jason Gregory. A K Petres/CRC Press 2014. ISBN 978-1466560017
-Programming: Principles and Practice Using C++ (Second edition), Bjarne Stroustrup. Addison-Wesley 2014, ISBN 978-0-321-99278-9

Detailed bibliography

-Software engineering. A Practitioner's Approach, Roger S. Pressman. McGraw Hill 2001, ISBN 84-81-3214-9
-Game Physics 2nd Edition, David H. Eberly. CRC Press 2010, ISBN 978-0123749031

Journals

Web sites of interest

http://unveopoper.nvidia.com
http://www.gamedev.net/

OBSERVATIONS

COURSE GUIDE 2023/24

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

idem

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

COURSE GUIDE 2023/24

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

AQCADEMIC YEAR 2022/2023

ASSOCIATED PROFESSOR Dr.JOSE MARIA LOMAS

SHORT DESCRIPTION.
Production and transformation processes of raw materials and resources into the main chemical products.

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

Los trabajos de las prácticas de campo, en caso de no superar la asignatura, se guardan para el siguiente curso sólo un año.

COURSE GUIDE 2023/24

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

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

COURSE

26095 - Industrial Waste Management **Credits, ECTS:** 6

COURSE DESCRIPTION

SHORT DESCRIPTION.

Environmental problem of industrial waste. Regulatory regulations. Conventional and advanced physicochemical technologies for the treatment of toxic and dangerous waste. Thermal technologies. Stabilization and controlled deposit. Minimization and valorization as management strategies. Forest, Agricultural and Solid Urban Waste and its treatment.

CONTEXTUALIZATION OF THE SUBJECT IN THE DEGREE.

This is an optional subject in the 4th year (2nd semester) that tries to provide the scientific-technological foundations of the integral management of industrial residues.
This subject does not have prerequisites, although it is advisable to have previously taken the subjects of the Industrial Chemistry Module, especially " Industrial Chemistry" in the third year and "Environmental Technologies", in the first semester of the 4th year.
The knowledge and skills acquired by studying "Industrial Waste Management", together with those of the optional subjects "Biological Treatment of Effluents" and "Treatment of Atmospheric Pollution", provide the technological foundations required for the comprehensive management of industrial waste (solid) and effluents (liquid and gaseous) generated in industrial activity.
The expertise and abilities related to the management of industrial residues are very useful in the professional practice of all branches of Industrial Engineering, since the activities of the most important industrial sectors generate toxic and dangerous waste.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

GENERAL OBJECTIVE
Provide the scientific-technological foundations of the main strategies to carry out an integral and sustainable management of toxic and dangerous industrial waste and know how to use the regulations that regulate its categorization and management.
The graduate in Industrial Engineering must know how to deal with the problems associated with the generation and management of this waste and be trained to promote minimization and recovery in production lines. Studying this subject acquires the basic training necessary for it.

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).

Each of the specific competencies (CE) corresponds to the competencies [C], [CRI] and [TEQI] of the Study Plan indicated in each case.
•(CE1) Be able to categorize the toxic and/or dangerous nature of the waste generated in industrial activities and assess its environmental management in accordance with current legislation [C6 / C11 / CRI17 / CRI18 / TEQI11].
•(CE2) Be able to decide the most suitable equipment and its characteristics for the different stages that, in general, make up the treatment of industrial waste – physical-chemical, thermal and stabilization-controlled deposit – using sustainability criteria [C3 / C5 / CRI10 / CRI18 / TEQI1 / TEQI8 / TEQI12].

•(CE3) Be able to propose different treatment alternatives for the main types of industrial waste, sequentially describing all its stages, and the technological and sustainability advantages and disadvantages of each alternative [C4 / C5 / C7 / CRI10 / CRI13 / CRI18 /TEQI1/TEQI8/TEQI12].

•(CE4) Be able to question, decide and reasonably justify which is the Best Available Technology(s) (BAT) among

the different technological alternatives for the management of the main types of RTPs, using strategies of the scientific methodology and sustainability criteria [C3 / C4 / C5 / C7 / CRI10 / CRI13 / TEQI1 / TEQI8].

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

THEORETICAL-PRACTICAL CONTENT.

CT: Theoretical Content CP: Practical Content.

UNIT 1- GENERALITIES, CONCEPTS AND ORIGIN OF WASTE.

Generalities, concepts and origin of waste. Environment. Contaminating vectors. Introduction to air pollution. Introduction to water pollution. Waste definitions. Zero residue notion. The limits of recycling. Recycling and materials science. The sustainability. Common environmental problems in the EU. Notion of Industrial Ecology

SUBJECT 2- CLASSIFICATION AND MANAGEMENT OF WASTE. THE BAG OF BY-PRODUCTS.

Waste treatment policy. Eco-production: prevention at source and minimization of waste. Minimization of containers and packaging. The Waste Bags. Recycling. The Waste Catalog. Waste classification. Introduction to the Life Cycle. Priorities in waste management. Spill and Life Cycle. Agenda 21.

UNIT 3- TECHNOLOGIES APPLICABLE TO WASTE TREATMENT. RECOVERY AND MANUFACTURING OF MATERIALS FROM WASTE.

Introduction and definitions related to waste treatment. Selection of the treatment process. Technologies applicable to multidisciplinary recycling. physical techniques. chemical techniques. Physicochemical techniques. Biological techniques. mixed systems. Regeneration of used solvents. Volatile compound treatments. Metal recovery treatments. The composting. Aerobic treatment process. The methanation. Aerobic treatment process. Summary of technologies suitable for recycling waste. Types of waste and technologies applicable to recycling.

UNIT 4- TYPOLOGY OF WASTE IN ORDER OF RECYCLING..

Notion of contaminant load. Risk factors associated with waste Leaching and contaminant load. Leaching test. resistance to leaching. Waste coding. Waste catalog. The typologies of waste, its coding and the systematics of the catalog for the treatment and recovery of waste. Potentially Hazardous Waste Constituents. Activities that can generate potentially hazardous waste. Waste and applicable technologies for its recycling. Contaminant concentration and recovery. Direct and indirect recycling. Multidisciplinary recycling. Recycling of materials in Europe. Contaminated soils as recoverable waste. Market for environmentally correct products and services. Installations, mechanisms and tools to reduce the impact of waste

UNIT 5- WASTE DESTINED FOR THE MANUFACTURE OF INSULATING MATERIALS.

Generalities, concepts and properties derived from light waste. Waste applications for the manufacture of insulators. Substrates and supports. Insulators made from waste. Acoustic screens

UNIT 6- WASTE DESTINED FOR THE MANUFACTURE OF DENSE MATERIALS.

Introduction. Contributions of ceramics to the recovery of waste. Recovery of waste with high asbestos content. The cement industry as a means of recovery of waste. The cement industry as a means of recovering waste

UNIT 7- VITRIFIABLE WASTE.

Vitrifiable waste. Inertization of waste through vitrification. Vitrification as an industrial technology. Vitrification of radioactive materials.

UNIT 8- ASSESSMENT OF WASTE FROM LARGE INDUSTRIES.

Recovery of waste from the energy mining industry. The electricity generation sector. Recovery of waste from the steel and metallurgical industry. Chemical Industry

UNIT 9 - MINING WASTE.

NOT THIS YEAR

UNIT 10- USE OF AGRICULTURAL AND FORESTRY RESIDUES.

Definitions and introduction. Origin and sources of biomass. Strategies for Energy recovery from biomass. Biomass utilization potential and costs.

UNIT 11 VALORIZATION AND TREATMENT OF MUNICIPAL WASTE.

Introduction. Composition and evolution of MSW. Toxic waste in MSW. Controlled landfill

UNIT 12. SLUDGE FROM WWTP TREATMENT PLANT.

NOT THIS YEAR

UNIT 13. RESIDUAL PLASTICS AND THEIR REUSE.

NOT THIS YEAR

NOT THIS YEAR

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.

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

- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 55%
- Teamwork assignments (problem solving, Project design) 45%

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.
The written tests will account for 50% and the cooperative activities for 50% of the final grade for the subject.
The FINAL MARK will be obtained by applying these percentages to the average grade of the written tests and to the average grade of the cooperative activities, with the following REQUIREMENTS:
(a) To average the note of the written tests it will be necessary to obtain a minimum grade of 4/10 in each one of them.
(b) To average the note of the cooperative activities it will be necessary to have carried out all the activities and obtain a minimum grade of 4/10 in each one of them.
To pass the subject it will be necessary to obtain a final grade of 5/10.
The results of the evaluation will be reported within a week after taking the test or handing in and presenting the activity in class, so that the student can redirect learning by following the guidelines provided by the teacher.

WRITTEN TESTS (50%).

One or two written tests will be carried out and, if the result of the evaluation is negative, a third test (in June). The tests will include questions and application exercises related to the theoretical-practical contents that are the object of evaluation in each test.
The set of tests will evaluate the specific competences [CE1, CE2, CE3, CE4].
If the evaluation of the written tests is not favourable, the teacher will provide the student with complementary material to pass the learning objectives. Tutorials will be used to resolve doubts and/or difficulties that arise.

COOPERATIVE ACTIVITIES (50%).

Various cooperative activities will be carried out. Each of them will be assigned a score based on its degree of difficulty and the scope of the work. In each cooperative activity, the achievement of all TRANSVERSAL COMPETENCES will be evaluated, as well as the specific competence(s) that are indicated in each of them – depending on their theme and the type of activity-.
The evaluation instrument in each activity will be an EVALUATION RUBRIC OR MATRIX, which WILL DETAIL THE CRITERIA AND INDICATORS that are used to evaluate the achievement of the competencies and the SCORE of each of them, which will be used to analyze and assess the PRODUCTS OF ACTIVITY:
(a) The DELIVERABLE generated in the activity and its ORAL PRESENTATION. The evaluation criteria will use as

indicators the structure of the work, the success and rigor in the treatment of the contents, the absence of misconceptions, the validity/feasibility of the proposed technological solution, the quality of the bibliographic sources used, the presentation and the quality of the writing, as well as the clarity of the oral presentation, the ability to communicate and the ability to respond in the debate, among others.
(b) The SELF-ASSESSMENT REPORT OF THE COOPERATIVE WORK CARRIED OUT. The evaluation criteria will use as indicators the degree of participation of the members of the group in the cooperative forum and the relevance of their contributions, their attitude in the group, the coordination of the members, the adjustment to the planned schedule and work plan, the participation in the oral presentation and/or in the debate and the degree of knowledge of the work carried out that is demonstrated in both cases, among others.
If the evaluation of the tasks is not satisfactory, the teacher will guide the group to modify the aspects of the activity that need to be improved, in order to redirect the learning and pass - if necessary - a new evaluation of the activity.
Tutorials will be used to resolve doubts and/or difficulties and monitor the work.aluación de la actividad.
Tutorials will be used to resolve doubts and/or difficulties and monitor the work.

(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

RODRÍGUEZ JIMÉNEZ J.J. E IRABIEN GULIAS A. Gestión sostenible de residuos peligrosos. Madrid: Editorial Síntesis S.A., 2013.

CARMEN OROZCO BARRENETXEA ET AL. Contaminación Ambiental. Una Visión Desde La Química. Ediciones Paraninfo. 2011.

LAGREGA M.D. Gestión de residuos tóxicos. Tratamiento, eliminación y recuperación de suelos. New York: Mc Graw-Hill, 2006.

NEMEROW N.L. Tratamiento de vertidos industriales y peligrosos. Madrid: Díaz de Santos, 2006.

BIBLIOGRAPHY

Basic bibliography

LEVIN, M A [1]; GEALT, M A. Biotreatment of industrial and hazardous waste. U.S. Department of Energy. Office of Scientific and Technical Information. 2003

ELÍAS CASTELL . Reciclaje de residuos industriales: aplicación a la fabricación de materiales de construcción. Madrid: Díaz de Santos, 2012.

Detailed bibliography

PARDEEP SINGH, PRAMIT VERMA, et al.. Waste Management and Resource Recycling. Elsevier, 2022.

GEORGE TCHOBANOGLOUS, FRANK KREITH. Handbook of Solid Waste Management. McGraw HILL PROFESSIONAL, 2002
WOODARD & CURRAN, I. Industrial Waste Treatment Handbook. Elsevier, 2005

Journals

ASCE Practice Periodical of Hazardous Toxic and Radioactive Waste Management (USA). ASCE.
http://www.pubs.asce.org/journals/hz.html

Environmental Law & Management. Wiley Interscience.
http://www3.interscience.wiley.com/maintenance.html?DESCRIPTOR=PRINTISSN&VALUE=1067-6058

Environmental Science & Technology. American Chemical Society (ACS).
http://pubs.acs.org/journals/esthag/index.htm

Residuos. La revista técnica de Medio Ambiente.
http://www.revistaresiduos.com/RevistaResiduos/

Warmer Bulletin España. Instituto para la sostenibilidad de los Recursos (ISR).
http://www.isrcer.org/warmer_new.asp

Waste Management. International Journal of Integrated Waste Management, Science and Technology. Elsevier.
http://www.elsevier.com/wps/find/journaldescription.cws_home/404/description#description

Web sites of interest

Activities of the European Union in the field of waste management. Legislation.
http://europa.eu.int/scadplus/leg/es/s15002.htm

Community of Waste Management Professionals.
http://www.ictnet.es/ICTnet/home/cv/?area=mAmb&cv=residuos

ECOVIDRIO. Non-profit organization for glass recycling in Spain
https://www.ecovidrio.es/

National Institute of Safety and Hygiene. Ministry of Labour and Social Affairs. Legislation.
http://www.mtas.es/insht/legislation/tl_res.htm

Tecnociencia. Technical information on waste. Legislation.
http://www.tecnociencia.es/especiales/residuos/

OBSERVATIONS

COURSE GUIDE 2023/24

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 Mechanics. When studying solids, two types are distinguished: rigid solid and deformable solid. In this subject, it will be considered that solids are deformable.
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

Knowledge and use of the principles of strength of materials for the calculation and design of automobile structures.

CONTENIDOS TEÓRICO-PRÁCTICOS

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 semester, there will be a midterm exam, which in case of being passed, will release material for the final exam. This exam, together with the possible problems collected in class, will account for 20% of the final grade.
A work will be proposed to be carried out by the students whose weight in the final grade will be 50%.
The final exam will have a weight of 30% in the final grade. In this exam, a minimum of 5 must be obtained to pass the subject.

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

The written tests to be developed are detailed below:
A midterm exam will be held in the middle of the semester. The approval of this exam releases contents. The final exams will be attended with pending contents.
The final mark of the exams will be the average of the two parts.
Who does not appear to the final exam, will obtain a grade of not presented.
The work has a value of 50% of the final grade. For the evaluation of the work, the following will be taken into account:
- The document: Quality, skills developed at work (minutes, tutorials, face-to-face hours).
- The presentation: Peer evaluation, teacher evaluation, attendance and participation.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The same as in ordinary call.

MANDATORY MATERIALS

Theory and problems explained during lectures.

BIBLIOGRAFÍA

Basic bibliography

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.
Luis Ortiz Berrocal. Resistencia de Materiales. Editorial Mc Graw Hill

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.

COURSE GUIDE 2023/24

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.

CONTENIDOS TEÓRICO-PRÁCTICOS

- 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

BIBLIOGRAFÍA

Basic bibliography

- Teachers notes

Detailed bibliography

-The Finite Element Method, O.C. Zienkiewicz. Ed Reverté.

Journals

-

Web sites of interest

OBSERVATIONS

COURSE GUIDE 2023/24

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