Universidad del País Vasco Euskal Herriko Unibertsitatea

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

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

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

## English Friendly Courses taught in SPANISH:

**FACULTY OF ENGINEERING - VITORIA-GASTEIZ (163)**

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

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

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

Universidad del País Vasco Euskal Herriko Unibertsitatea

## FACULTY OF ENGINEERING - VITORIA-GASTEIZ (163)

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

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Universidad del País Vasco Euskal Herriko Unibertsitatea

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

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

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

Universidad del País Vasco Euskal Herriko Unibertsitatea

## English Friendly Courses taught in BASQUE:

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

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

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

Universidad del País Vasco — Euskal Herriko Unibertsitatea

**COURSE GUIDE** 2024/25

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

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

## COURSE

25974 - Physical Basics of Engineering **Credits, ECTS:** 12

## COURSE DESCRIPTION

Ingeniaritzaren Oinarri Fisikoak irakasgaiak bere zeregina betetzen du ingeniaritzako ikasleak lehenengo mailetan lortu behar dituen ezagutza orokorretako batzuen eskaintzarekin, Fisika Orokorraren oinarrizko atal guztiak landuz (Mekanika, Termodinamika, Jariakinak, Elektromagnetismoa eta uhinak) Betiere, garapen teknologiko berriei egokitzeko oinarria eskainiz, baina baita metodo zientifikoaren ezaugarri diren prozedura eta zorroztasuna transmitituz ere, gerora baliagarriak izango zaizkionak ikasleari bere ingeniari lana egiteko.
Ingeniaritzaren Oinarri Fisikoak irakasgaiak oinarri sendoa eskaintzen die hurrengo ikasturteetan ikasleak landu beharko dituen beste irakasgai batzuentzat, hala nola, Mekanika, Fluidoen Mekanika, Termodinamika, eta abar. Oinarrizko irakasgaia da ingeniaritzarako ikasketetan.

## COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

Gaitasun espezifikoak
1. Zuzen interpretatu prozesu naturalak deskribatzeko Fisikaren oinarrizko teoriak.
2. Behar bezala identifikatu egoera fisiko ezberdinak izan arren antzeko puntuak ere badituztenak, problema berriei lehendik ezagutzen ditugun ebazpideak aplikatzeko.
3. Banaka nahiz taldean, problemak ebatzi eta emaitzak analizatu, horien magnitude maila ondo zenbatetsiz.
4. Banaka nahiz taldean, laborategian lortutako datu esperimentalak deskribatu, analizatu eta kritikoki ebaluatu.
5. Edonolako neurketa zein kalkulu fisikoren ziurgabetasuna zenbatesten jakin, eta datu esperimentalak tratatzen jakin haien artean eragin-ondorio erlazio kuantitatiboak lortzeko, betiere irakasgaiaren arloan.

## Theoretical and Practical Contents

Eduki teorikoak
1. Gaia. Fisikarako sarrera.
2. Gaia. Aljebra eta Kalkulu bektoriala.
3. Gaia. Partikularen zinematika.
4. Gaia. Mekanika Klasikoaren oinarriak.
5. Gaia. Partikularen dinamika orokorra.
6. Gaia. Higidura oszilakorra.
7. Gaia. Partikula-sistemen dinamika.
8. Gaia. Solido zurrunaren dinamika.
9. Gaia. Elastikotasuna.
10. Gaia. Jariakinak.
11. Gaia. Termodinamika I. Kontzeptu orokorrak: Lehen printzipioa.
12. Gaia. Termodinamika II. Bigarren printzipioa.
13. Gaia. Grabitazioa.
14. Gaia. Eremu elektrikoa hutsean.
15. Gaia. Eremu elektrikoa eta materia.
16. Gaia. Korronte elektrikoa.
17. Gaia. Eremu magnetikoa hutsean.
18. Gaia. Eremu magnetikoa eta materia.
19. Gaia. Indukzio elektromagnetikoa.
20. Gaia. Uhin-higidura.
21. Gaia. Optika geometrikoa.
22. Gaia. Fisika kuantikoa.

Eduki praktikoak
1. Erroreak eta neurriaren teoria
2. Ohmen legea
3. Pendulu sinplea
4. Hookeren legea: malgukien konstante elastikoa
5. Kalorimetria

## TEACHING METHODS

Irakasgai honetan erabilitako metodologia erabat aktiboa da eta honako elementuez osatuta dago:
1. Ikasgai magistralak:
Irakasleak ikasleari lagunduko dio ematen zaion informazio garrantzitsuena egituratzen (gai bakoitzaren laburpena antolatzeko, adibidez). Halaber, orientatu egingo du informazio gehigarria non aurki dezakeen azalduz

2. Problemen ebazpena (Ikasgela praktikak):
Lan honen garapenak ikuspegi ezberdinak ditu: talde osoaren testuinguruan, irakasleak hurrengo eskola-egunean egingo diren problemen berri emango die ikasleei eskolatik kanpo landu ditzaten eta eskola-egunean arbelean ebatziko ditu .
Talde txikien testuinguruan, bi astero, irakasleak lau bat problemako zerrenda emango die ikasleei eta hauek, biko taldetan, hurrengo astean ebatzita izan beharko dituzte. Orduan irakasleak arbelean ebatziko ditu.
3. Laborategiko praktikak:
Ikasleek laborategiko praktikak egingo dituzte, taldeka, horretarako esleitutako denboran. Ikasleei gidoi bat emango zaie egin beharreko praktika bakoitzarentzat, bertan, praktika planteatzeaz gain, zein urratsi jarraitu beharko dieten ere azalduko zaie.
4. Azterketak:
Horien barruan kontuan hartzen dira idatzizko proba, bera, egitea zein ikasleak hura gertatzeko egin behar duen ahalegina.
5. Tutoretza:
Tutoretza lana ohiko moduan uler daiteke, ikaslea, bakarka edo talde txikian, irakaslearen bulegora joaten denekoa, zein modu orokorragoan, on-line egin daitezkeenak ere kontuan hartuz.
6. Hezkuntzarako plataforma birtualak (CMS, ingelesezko Content Management System):
Sistema hauek ikastaroaren garapenerako garrantzizkoak diren edukien kudeaketa ahalbidetuko dute.

## TYPES OF TEACHING

| Types of teaching | M | S | GA | GL | GO | GCL | TA | TI | GCA |
|---|---|---|---|---|---|---|---|---|---|
| Hours of face-to-face teaching | 90 | | 15 | 15 | | | | | |
| Horas de Actividad No Presencial del Alumno/a | 135 | | 22,5 | 22,5 | | | | | |

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

## Evaluation methods

- Continuous evaluation
- End-of-course evaluation

## Evaluation tools and percentages of final mark

- Written test, open questions 65%
- Exercises, cases or problem sets 15%
- Individual assignments 5%
- Teamwork assignments (problem solving, Project design) 15%

## ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Ebaluazio jarraitu eredua erabiliko da, segidan aipatzen diren ebaluazio tresnak erabiliz. Ebaluazio jarraiaren bitartez irakasgaia gainditzeko kontrolak guztiak egin, laborategiko txosten guztiak entregatu eta proposatutako zereginen 75% entregatu behar da gutxienez. Aurrekoetakoren bat arrazoi justifikaturen bategatik bete ezean behar bezala akreditatu beharko da. Ikasleren batek ez badu nahi edo ezin badu metodo honekin jarraitu, eduki eta konpetentzia guztiak ebaluatuko dituen azken proba bat egiteko aukera izango du. Horretarako, ebaluazioa jarraiari uko egin beharko dio idatziz azken proba baino aste bete lehenago gutxienez. Ebaluazio jarraia eta proba bakarraren bidezko ebaluazioak bateraezinak dira.

- Kontrolak: Ikasturtean zehar 4 azterketa partzial egingo dira eta irakasgairi dagokio kalifikazioaren 70%-a balioko dute ondoren azaltzen den bezala banatuta. Lehenengoak 10%, bigarrenak, hirugarrenak eta laugarrenak 20% bakoitzak. Irakasgaia ebaluazio jarraiaren bitartez gainditzeko nahitaezkoa izango da 10etik 3ko kalifikazioa lortzea kontroletako bakoitzean, hurrengo paragrafoan dioena dioela.

Aurreko kontroletako batean lortutako kontrako nota berreskuratzeko aukera dago azken azterketa partzialean. Horretarako, azken kontrolean, hala eskatzen duen ikasleak esandako kontrol horren azterketa ere egin ahal izango du. Kontrol hori bereizita ebaluatuko da eta, batez bestekoa kalkulatzeko orduan, aurreko kontrolean lortutako nota ordezkatuko du (hura handiagoa edo txikiagoa izan). Kasu honetan ez da gutxieneko notarik eskatzen. Aukera izateko, idatziz eskatu beharko da, azken azterketa partziala egin baino astebete lehenago gutxienez.

- Zereginen entrega: Irakasgaiko gai bakoitzeko problema edo lan bat proposatuko da. Zeregin batzuk 3 pertsonako taldeetan egiteko izango dira klasetik kanpo (zereginen 2/3 gutxi gora behera) eta beste batzuk banaka egingo dira klase orduetan (zereginen 1/3 3 gutxi gora behera). Guztira azken kalifikazioaren 15%-a balioko dute.

- Laborategiko txostenak: Laborategian ikasleek izandako errendimendua ebaluatzeko balio dute. Azken kalifikazioaren 10% balioko dute eta laborategiko txostenetan lortutako kalifikazioen batez bestekoa eginez lortzen da.

- Azken proba idatzia: Emandako epeen barruan eskatzen duten ikasleak, 5 konpetentzia espezifikoak ebaluatuko dituen idatzizko azken azterketara aurkeztu ahal izango dira. Hiru atal izango ditu: teoria zati bat, problemen zati bat eta laborategiko jarduerekin erlazionatutako zati bat.

Ebaluazio jarraituari formulario normalizatu bidez berariaz uko egiten ez bazaio, ikaslea kalifikatua izango da. Era beran, Ebaluazio jarraituari uko egin eta idatzizko azken azterketara aurkezten ez bada, aurkeztu gabekotzat kalifikatuko da.

Irakasgaiaren ebaluazio presentziala egin ezin bada, dagozkion aldaketak egingo dira online ebaluazio bat egiteko, UPV/EHUn dauden tresna informatikoak erabiliz. Online ebaluazio horren ezaugarriak ikasle-gidetan eta eGelan argitaratuko dira.

## EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Ezohiko deialdian bost gaitasun espezifikoak ebaluatuko dituen azken azterketa bat izango da Eskolak erabakitako egutegiaren arabera. Azterketa hori hiru atalez osatuko da: teoriako bat, problemetako beste bat eta laborategiko lanarekin lotutako beste bat.
Nola nahi ere, ezinbestekoa izango da 4 eta 5 gaitasunak lortzea beste gaitasunak ebaluatuak izan daitezen.

Irakasgaiaren ebaluazio presentziala egin ezin bada, dagozkion aldaketak egingo dira online ebaluazio bat egiteko, UPV/EHUn dauden tresna informatikoak erabiliz. Online ebaluazio horren ezaugarriak ikasle-gidetan eta eGelan argitaratuko dira.

## MANDATORY MATERIALS

Apunteak
1. E. Apiñaniz et al., Fisika, Bilboko Ingeniaritza Goi Eskola Teknikoko argitalpen zerbitzua, 2015.
2. E. Apiñaniz et al., Fisika Aurreratua, Bilboko Ingeniaritza Goi Eskola Teknikoko argitalpen zerbitzua, 2015.

## BIBLIOGRAPHY

### Basic bibliography

1. Fishbane P. M., Gasiorowicz S., Thornton S. T. Fisika zientzialari eta ingeniarientzat, 2008. UPV-EHU, Argitalpen zerbitzua.
2. Tipler P.A., Mosca G. Física para la ciencia y la tecnología. 6ª edición, 2010. Ed. Reverté.
3. Sears F.W., Zemansky M.W., Young H.D., Freedman R.A. Física Universitaria. 12ª edición, 2009. Ed. Addison Wesley .

### Detailed bibliography

1. Etxebarria J. R. (arg.). Fisika Orokorra. 2. argitalpena, 2003. UEUko Fisika Saila.
2. Eisberg R.M., Lerner L.S. Física: fundamentos y aplicaciones, 1983. Mc Graw Hill.
3. Feynman, Leighton y Sands. Física (The Feynman Lectures on Physics). Addison-Wesley Iberoamericana.
4. Serway R.A., Jewett J.W.. Física. 3ª edición, 2003. Ed. Thomson.

### Journals

Dibulgazio-aldizkariak
1. Invesigación y Ciencia. Edición española de Scientific American, Prensa Científica.
2. Mundo Científico, Versión en castellano de La Recherche, Fontalba.
3. Revista Española de Física, Real Sociedad Española de Física.
4. Physics Today, American Institute of Physics, http://physicstoday.com *
5. The New Scientist online, http://www.newscientist.com *

### Web sites of interest

1. A. Franco, Física con ordenador: curso interactivo de física en internet, http://www.sc.ehu.es/sbweb/fisica/
2. M. J. Elejalde, A. Franco, E. Macho, Curso de Física, http://www.ehu.es/fisica
3. Eric Weisstein´s world of Physics, http://scienceworld.wolfram.com/physics/
4. MIT courseware, http://ocw.mit.edu
5. Física 2000, http://www.maloka.org/f2000
6. Applets Java de Física, http://www.walter-fendt.de/ph11s/
7. Educaplus, http://www.educaplus.org/
8. Física Interactiva, http://usuarios.lycos.es/pefeco/

## OBSERVATIONS

Universidad del País Vasco — Euskal Herriko Unibertsitatea

**COURSE GUIDE** 2024/25

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

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

## COURSE

25974 - Physical Basics of Engineering **Credits, ECTS:** 12

## COURSE DESCRIPTION

La asignatura Fundamentos Físicos de la Ingeniería cumple su papel en la formación de los futuros ingenieros e ingenieras ofreciéndoles parte de la formación generalista, necesaria para su adaptación a los nuevos desarrollos tecnológicos, a partir de los conocimientos básicos de todas las ramas de la Física.
Además, se transmiten los procedimientos y el rigor del método científico como marco de desarrollo de su labor como ingeniero o ingeniera. Asimismo, se aportan los contenidos necesarios con que abordar otras materias incluidas en el plan de estudios tales como Mecánica, Mecánica de fluidos, Termodinámica, etc. Como se puede ver, Fundamentos Físicos de la Ingeniería es una asignatura básica para los estudios de Ingeniería.

## COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

Competencias específicas:
1. Interpretar correctamente las teorías físicas más importantes para la descripción de los procesos naturales.
2. Identificar apropiadamente situaciones diferentes físicamente pero que muestren analogías para poder utilizar soluciones ya conocidas en problemas nuevos.
3. Resolver problemas y analizar las soluciones de los mismos en grupo e individualmente, así como evaluar de forma clara sus órdenes de magnitud.
4. Obtener, describir, analizar y evaluar críticamente en grupo e individualmente los datos experimentales obtenidos en el laboratorio.
5. Estimar la incertidumbre de cualquier medida y de los resultados de cálculos físicos y tratar datos experimentales para obtener con ellos relaciones cuantitativas causa-efecto, dentro del ámbito de la asignatura.

## Theoretical and Practical Contents

Contenidos teóricos:
1.- Introducción a la Física.
2.- Algebra y cálculo vectorial.
3.- Cinemática de la partícula.
4.- Principios de la Mecánica Clásica.
5.- Dinámica general de la partícula.
6.- Movimiento oscilatorio. Fuerzas elásticas.
7.- Dinámica de los sistemas de partículas.
8.- Dinámica del sólido rígido.
9.- Elasticidad. Sólidos reales.
10.- Fluidos.
11.- Termodinámica I.
12.- Termodinámica II.
13.- Interacción electrostática en el vacío.
14.- Interacción electrostática en la materia.
15.- Corrientes eléctricas estacionarias.
16.- Interacción magnetostática en el vacío.
17.- Inducción electromagnética.
18.- Ondas electromagnéticas. Ondas mecánicas.
19.- Introducción a la óptica geométrica.

Contenidos prácticos:
1. Errores y teoría de la medida.
2. Estudio de las fuerzas en un plano inclinado.
3. Péndulo simple.
4. Ley de Hooke: constante elástica de un muelle.
5. Ley de Ohm.

## TEACHING METHODS

La metodología utilizada en esta asignatura es eminentemente activa y contiene los siguientes elementos:
1. Clase expositiva:
Se seguirá el modelo de clase magistral. El profesor o la profesora orientará al o a la estudiante sobre cómo debe estructurar la información más importante que se le comunica y dónde puede ampliar con otros enfoques e información adicional lo dado en clase.
2. Resolución de problemas (Prácticas de aula):
El desarrollo de esta tarea incluye diversos aspectos: en el contexto del gran grupo, el profesor o la profesora informa el día anterior de los problemas que se van realizar en la clase del día siguiente. El profesor o la profesora resuelve en la

pizarra dichos problemas. En el contexto del grupo reducido, cada dos semanas el profesor o la profesora proporciona una lista a los estudiantes de cuatro problemas, aproximadamente, que deben resolver en grupos de dos estudiantes. A la semana siguiente el profesor o la profesora los corrige en la pizarra.
3. Prácticas de laboratorio:
Las prácticas de laboratorio serán realizadas por los alumnos y las alumnas en parejas en el tiempo dedicado a tal fin. Se distribuirá a los y las alumnas un guión de cada práctica que vayan a realizar en el cual no sólo se planteará el problema sino que se les irá indicando el procedimiento a realizar para resolverlo.
4. Exámenes y cuestionarios:
Bajo estos términos se engloban tanto la realización de la prueba escrita propiamente dicha como la preparación de la misma por parte del o de la estudiante.
5. Tutorías:
Las tutorías pueden entenderse tanto en el sentido tradicional del término en el que el alumno o la alumna, solo o en grupo, acude al despacho del profesor o la profesora, como en sentido más general que incluye las celebradas on-line.

## TYPES OF TEACHING

| Types of teaching | M | S | GA | GL | GO | GCL | TA | TI | GCA |
|---|---|---|---|---|---|---|---|---|---|
| Hours of face-to-face teaching | 90 | | 15 | 15 | | | | | |
| Horas de Actividad No Presencial del Alumno/a | 135 | | 22,5 | 22,5 | | | | | |

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

## Evaluation methods

- Continuous evaluation
- End-of-course evaluation

## Evaluation tools and percentages of final mark

- Written test, open questions 65%
- Exercises, cases or problem sets 15%
- Individual assignments 5%
- Teamwork assignments (problem solving, Project design) 15%

## ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Se utilizará un modelo de evaluación continua utilizando los instrumentos de evaluación que se resumen a continuación:

1. Cuestionarios:
El grado de consecución de las competencias 1, 2 y 3 se evaluará realizando 4 cuestionarios a lo largo del curso. Cada uno de estos cuestionarios tendrá una duración de 1 hora y un peso en la nota final de un 20%. Hay que obtener más de 3 puntos en, al menos, 3 de los cuestionarios para que se realice el cómputo y, por tanto, poder superar la asignatura.
2. Informes de laboratorio:
Se utilizan para evaluar el rendimiento del o de la estudiante en el laboratorio. Supondrán un 10% de la nota final que se calculará mediante el promedio de la nota obtenida en cada uno de los informes.
3. Rúbrica:
Sirve para evaluar algunos aspectos que no son fácilmente medibles mediante los instrumentos anteriores, bien por implicar un cierto grado de subjetividad, bien por requerir un seguimiento periódico de aspectos no evaluables mediante pruebas presenciales. Esta rúbrica supondrá el 10% de la nota final.
4. Examen final escrito:
Aquéllos estudiantes que lo soliciten en el plazo estipulado por la UPV/EHU, podrán presentarse a un examen final escrito que evaluará las 5 competencias específicas y que constará de tres partes: una de teoría, una de problemas y un ejercicio relacionado con el trabajo de laboratorio.
En cualquier caso, será imprescindible adquirir las competencias número 4 y 5 para que sean evaluadas el resto de competencias.

## EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

En la convocatoria extraordinaria el alumno o alumna deberá realizar un examen final escrito que evaluará las 5 competencias específicas y que constará de tres partes: una de teoría, una de problemas y un ejercicio relacionado con el trabajo de laboratorio.
En cualquier caso, será imprescindible adquirir las competencias número 4 y 5 para que sean evaluadas el resto de competencias.

## MANDATORY MATERIALS

1. E. Apiñaniz et al., Fisika, Bilboko Ingeniaritza Goi Eskola Teknikoko argitalpen zerbitzua, 2015.
2. E. Apiñaniz et al., Fisika Aurreratua, Bilboko Ingeniaritza Goi Eskola Teknikoko argitalpen zerbitzua, 2015.

## BIBLIOGRAPHY

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1. Fishbane P. M., Gasiorowicz S., Thornton S. T. Fisika zientzialari eta ingeniarientzat, 2008. UPV-EHU, Argitalpen zerbitzua.
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3. Giancoli D.C. (2009), Física para Ciencias e Ingeniería con Física Moderna. Pearson Educación.
4. Feynman, Leighton y Sands. Física (The Feynman Lectures on Physics). Addison-Wesley Iberoamericana
5. Alonso M. y Finn E.J. Física vols. I y II. México, Fondo educativo interamericano S.A.

### Journals

1. Invesigación y Ciencia. Edición española de Scientific American, Prensa Científica.
2. Mundo Científico, Versión en castellano de La Recherche, Fontalba.
3. Revista Española de Física, Real Sociedad Española de Física.
4. Physics Today, American Institute of Physics, http://physicstoday.com
5. The New Scientist online, http://www.newscientist.com

### Web sites of interest

1. A. Franco, Física con ordenador: curso interactivo de física en internet, \url{http://www.sc.ehu.es/sbweb/fisica/
2. M. J. Elejalde, A. Franco, E. Macho, Curso de física, \url{http://www.ehu.es/fisica
3. Eric Weisstein's world of Physics, \url{http://scienceworld.wolfram.com/physics/
4. MIT courseware, \url{http://ocw.mit.edu
5. Física 2000, \url{http://www.maloka.org/f2000
6. Java de Física, \url{http://www.walter-fendt.de/ph11s/
7. Educaplus, \url{http://www.educaplus.org/
8. Física Interactiva, \url{http://usuarios.lycos.es/pefeco/

## OBSERVATIONS

Universidad del País Vasco — Euskal Herriko Unibertsitatea

**COURSE GUIDE** 2024/25

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

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

## COURSE

25974 - Physical Basics of Engineering **Credits, ECTS:** 12

## COURSE DESCRIPTION

La asignatura Fundamentos Físicos de la Ingeniería cumple su papel en la formación de los futuros ingenieros e ingenieras ofreciéndoles parte de la formación generalista, necesaria para su adaptación a los nuevos desarrollos tecnológicos, a partir de los conocimientos básicos de todas las ramas de la Física.
Además, se transmiten los procedimientos y el rigor del método científico como marco de desarrollo de su labor como ingeniero o ingeniera. Asimismo, se aportan los contenidos necesarios con que abordar otras materias incluidas en el plan de estudios tales como Mecánica, Mecánica de fluidos, Termodinámica, etc. Como se puede ver, Fundamentos Físicos de la Ingeniería es una asignatura básica para los estudios de Ingeniería.

## COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

Competencias específicas:
1. Interpretar correctamente las teorías físicas más importantes para la descripción de los procesos naturales.
2. Identificar apropiadamente situaciones diferentes físicamente pero que muestren analogías para poder utilizar soluciones ya conocidas en problemas nuevos.
3. Resolver problemas y analizar las soluciones de los mismos en grupo e individualmente, así como evaluar de forma clara sus órdenes de magnitud.
4. Obtener, describir, analizar y evaluar críticamente en grupo e individualmente los datos experimentales obtenidos en el laboratorio.
5. Estimar la incertidumbre de cualquier medida y de los resultados de cálculos físicos y tratar datos experimentales para obtener con ellos relaciones cuantitativas causa-efecto, dentro del ámbito de la asignatura.

## Theoretical and Practical Contents

Contenidos teóricos:
1.- Introducción a la Física.
2.- Algebra y cálculo vectorial.
3.- Cinemática de la partícula.
4.- Principios de la Mecánica Clásica.
5.- Dinámica general de la partícula.
6.- Movimiento oscilatorio. Fuerzas elásticas.
7.- Dinámica de los sistemas de partículas.
8.- Dinámica del sólido rígido.
9.- Elasticidad. Sólidos reales.
10.- Fluidos.
11.- Termodinámica I.
12.- Termodinámica II.
13.- Interacción electrostática en el vacío.
14.- Interacción electrostática en la materia.
15.- Corrientes eléctricas estacionarias.
16.- Interacción magnetostática en el vacío.
17.- Inducción electromagnética.
18.- Ondas electromagnéticas. Ondas mecánicas.
19.- Introducción a la óptica geométrica.

Contenidos prácticos:
1. Errores y teoría de la medida.
2. Estudio de las fuerzas en un plano inclinado.
3. Péndulo simple.
4. Ley de Hooke: constante elástica de un muelle.
5. Ley de Ohm.

## TEACHING METHODS

La metodología utilizada en esta asignatura es eminentemente activa y contiene los siguientes elementos:
1. Clase expositiva:
Se seguirá el modelo de clase magistral. El profesor o la profesora orientará al o a la estudiante sobre cómo debe estructurar la información más importante que se le comunica y dónde puede ampliar con otros enfoques e información adicional lo dado en clase.
2. Resolución de problemas (Prácticas de aula):
El desarrollo de esta tarea incluye diversos aspectos: en el contexto del gran grupo, el profesor o la profesora informa el día anterior de los problemas que se van realizar en la clase del día siguiente. El profesor o la profesora resuelve en la

pizarra dichos problemas. En el contexto del grupo reducido, cada dos semanas el profesor o la profesora proporciona una lista a los estudiantes de cuatro problemas, aproximadamente, que deben resolver en grupos de dos estudiantes. A la semana siguiente el profesor o la profesora los corrige en la pizarra.
3. Prácticas de laboratorio:
Las prácticas de laboratorio serán realizadas por los alumnos y las alumnas en parejas en el tiempo dedicado a tal fin. Se distribuirá a los y las alumnas un guión de cada práctica que vayan a realizar en el cual no sólo se planteará el problema sino que se les irá indicando el procedimiento a realizar para resolverlo.
4. Exámenes y cuestionarios:
Bajo estos términos se engloban tanto la realización de la prueba escrita propiamente dicha como la preparación de la misma por parte del o de la estudiante.
5. Tutorías:
Las tutorías pueden entenderse tanto en el sentido tradicional del término en el que el alumno o la alumna, solo o en grupo, acude al despacho del profesor o la profesora, como en sentido más general que incluye las celebradas on-line.

## TYPES OF TEACHING

| Types of teaching | M | S | GA | GL | GO | GCL | TA | TI | GCA |
|---|---|---|---|---|---|---|---|---|---|
| Hours of face-to-face teaching | 90 | | 15 | 15 | | | | | |
| Horas de Actividad No Presencial del Alumno/a | 135 | | 22,5 | 22,5 | | | | | |

**Legend:**
M: Lecture-based — S: Seminar — GA: Applied classroom-based groups
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## Evaluation methods

- Continuous evaluation
- End-of-course evaluation

## Evaluation tools and percentages of final mark

- Written test, open questions 65%
- Exercises, cases or problem sets 15%
- Individual assignments 5%
- Teamwork assignments (problem solving, Project design) 15%

## ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Se utilizará un modelo de evaluación continua utilizando los instrumentos de evaluación que se resumen a continuación:

1. Cuestionarios:
El grado de consecución de las competencias 1, 2 y 3 se evaluará realizando 4 cuestionarios a lo largo del curso. Cada uno de estos cuestionarios tendrá una duración de 1 hora y un peso en la nota final de un 20%. Hay que obtener más de 3 puntos en, al menos, 3 de los cuestionarios para que se realice el cómputo y, por tanto, poder superar la asignatura.
2. Informes de laboratorio:
Se utilizan para evaluar el rendimiento del o de la estudiante en el laboratorio. Supondrán un 10% de la nota final que se calculará mediante el promedio de la nota obtenida en cada uno de los informes.
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Sirve para evaluar algunos aspectos que no son fácilmente medibles mediante los instrumentos anteriores, bien por implicar un cierto grado de subjetividad, bien por requerir un seguimiento periódico de aspectos no evaluables mediante pruebas presenciales. Esta rúbrica supondrá el 10% de la nota final.
4. Examen final escrito:
Aquéllos estudiantes que lo soliciten en el plazo estipulado por la UPV/EHU, podrán presentarse a un examen final escrito que evaluará las 5 competencias específicas y que constará de tres partes: una de teoría, una de problemas y un ejercicio relacionado con el trabajo de laboratorio.
En cualquier caso, será imprescindible adquirir las competencias número 4 y 5 para que sean evaluadas el resto de competencias.

## EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

En la convocatoria extraordinaria el alumno o alumna deberá realizar un examen final escrito que evaluará las 5 competencias específicas y que constará de tres partes: una de teoría, una de problemas y un ejercicio relacionado con el trabajo de laboratorio.
En cualquier caso, será imprescindible adquirir las competencias número 4 y 5 para que sean evaluadas el resto de competencias.

## MANDATORY MATERIALS

1. E. Apiñaniz et al., Fisika, Bilboko Ingeniaritza Goi Eskola Teknikoko argitalpen zerbitzua, 2015.
2. E. Apiñaniz et al., Fisika Aurreratua, Bilboko Ingeniaritza Goi Eskola Teknikoko argitalpen zerbitzua, 2015.

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2. Mundo Científico, Versión en castellano de La Recherche, Fontalba.
3. Revista Española de Física, Real Sociedad Española de Física.
4. Physics Today, American Institute of Physics, http://physicstoday.com
5. The New Scientist online, http://www.newscientist.com

### Web sites of interest

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2. M. J. Elejalde, A. Franco, E. Macho, Curso de física, \url{http://www.ehu.es/fisica
3. Eric Weisstein's world of Physics, \url{http://scienceworld.wolfram.com/physics/
4. MIT courseware, \url{http://ocw.mit.edu
5. Física 2000, \url{http://www.maloka.org/f2000
6. Java de Física, \url{http://www.walter-fendt.de/ph11s/
7. Educaplus, \url{http://www.educaplus.org/
8. Física Interactiva, \url{http://usuarios.lycos.es/pefeco/

## OBSERVATIONS

Universidad del País Vasco Euskal Herriko Unibertsitatea

**COURSE GUIDE** 2024/25

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

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

## COURSE

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

## COURSE DESCRIPTION

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

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

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

## COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

COMPETENCES

SPECIFIC COMPETENCES

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

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

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

TRANSVERSAL COMPETENCES

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

LEARNING OUTCOMES

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

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

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

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

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

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

## Theoretical and Practical Contents

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

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

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

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

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

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

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

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

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

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

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

UNIT 11. ELECTROCHEMISTRY
- Redox reactions.

- Voltaic or galvanic cell.
- Electrolytic cell.

## TEACHING METHODS

PRESENTIAL ACTIVITIES

THEORETICAL CLASSES (45 h)

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

CLASSROOM PRACTICES (30 h)

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

LABORATORY PRACTICES (15 h)

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

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

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

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

TUTORSHIP SESSIONS

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

NON-PRESENTIAL ACTIVITIES (135 h)

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

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

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

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

## TYPES OF TEACHING

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

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

## Evaluation methods

- Continuous evaluation
- End-of-course evaluation

## Evaluation tools and percentages of final mark

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

## ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

EVALUATION SYSTEM

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

The written test will comprise two partial tests:

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

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

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

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

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

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

PRACTICAL ACTIVITIES (10 % of the final mark)

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

LABORATORY PRACTICES (20 % of the final mark)

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

REQUIREMENTS to pass the subject:

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

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

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

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

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

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

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

CALL RESIGNATION

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

FINAL TEST

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

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

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

REQUIREMENTS to pass the subject (FINAL TEST)

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

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

CALL RESIGNATION

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

**EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT**

The evaluation criteria in the extraordinary call will be:

- A written test formed by the following characteristics:

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

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

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

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

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

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

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

REQUIREMENTS to pass the subject

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

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

CALL RESIGNATION

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

## MANDATORY MATERIALS

Collections of problems and specific questions related to the subject.

## BIBLIOGRAPHY

### Basic bibliography

NOMENCLATURE OF INORGANIC CHEMISTRY

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

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LABORATORY PRACTICES

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

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

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

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

**Journals**

**Web sites of interest**

http://www.egela.ehu.es

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

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

**OBSERVATIONS**

Universidad del País Vasco Euskal Herriko Unibertsitatea

**COURSE GUIDE** 2024/25

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

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

## COURSE

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

## COURSE DESCRIPTION

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

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

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

## COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

COMPETENCES

SPECIFIC COMPETENCES

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

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

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

TRANSVERSAL COMPETENCES

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

LEARNING OUTCOMES

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

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

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

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

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

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

## Theoretical and Practical Contents

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

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

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

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

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

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

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

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

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

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

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

UNIT 11. ELECTROCHEMISTRY
- Redox reactions.

- Voltaic or galvanic cell.
- Electrolytic cell.

## TEACHING METHODS

PRESENTIAL ACTIVITIES

THEORETICAL CLASSES (45 h)

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

CLASSROOM PRACTICES (30 h)

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

LABORATORY PRACTICES (15 h)

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

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

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

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

TUTORSHIP SESSIONS

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

NON-PRESENTIAL ACTIVITIES (135 h)

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

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

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

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

## TYPES OF TEACHING

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

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

## Evaluation methods

- Continuous evaluation
- End-of-course evaluation

## Evaluation tools and percentages of final mark

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

## ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

EVALUATION SYSTEM

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

The written test will comprise two partial tests:

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

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

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

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

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

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

PRACTICAL ACTIVITIES (10 % of the final mark)

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

LABORATORY PRACTICES (20 % of the final mark)

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

REQUIREMENTS to pass the subject:

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

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

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

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

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

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

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

CALL RESIGNATION

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

FINAL TEST

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

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

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

REQUIREMENTS to pass the subject (FINAL TEST)

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

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

CALL RESIGNATION

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

**EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT**

The evaluation criteria in the extraordinary call will be:

- A written test formed by the following characteristics:

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

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

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

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

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

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

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

REQUIREMENTS to pass the subject

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

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

CALL RESIGNATION

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

## MANDATORY MATERIALS

Collections of problems and specific questions related to the subject.

## BIBLIOGRAPHY

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**Journals**

**Web sites of interest**

http://www.egela.ehu.es

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

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

**OBSERVATIONS**

Universidad del País Vasco Euskal Herriko Unibertsitatea

**COURSE GUIDE** 2024/25

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

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

## COURSE

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

## COURSE DESCRIPTION

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

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

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

## COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

COMPETENCES

SPECIFIC COMPETENCES

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

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

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

TRANSVERSAL COMPETENCES

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

LEARNING OUTCOMES

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

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

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

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

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

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

## Theoretical and Practical Contents

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

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

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

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

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

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

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

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

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

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

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

UNIT 11. ELECTROCHEMISTRY
- Redox reactions.

- Voltaic or galvanic cell.
- Electrolytic cell.

## TEACHING METHODS

PRESENTIAL ACTIVITIES

THEORETICAL CLASSES (45 h)

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

CLASSROOM PRACTICES (30 h)

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

LABORATORY PRACTICES (15 h)

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

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

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

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

TUTORSHIP SESSIONS

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

NON-PRESENTIAL ACTIVITIES (135 h)

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

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

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

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

## TYPES OF TEACHING

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

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

## Evaluation methods

- Continuous evaluation
- End-of-course evaluation

## Evaluation tools and percentages of final mark

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

## ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

EVALUATION SYSTEM

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

The written test will comprise two partial tests:

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

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

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

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

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

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

PRACTICAL ACTIVITIES (10 % of the final mark)

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

LABORATORY PRACTICES (20 % of the final mark)

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

REQUIREMENTS to pass the subject:

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

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

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

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

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

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

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

CALL RESIGNATION

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

FINAL TEST

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

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

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

REQUIREMENTS to pass the subject (FINAL TEST)

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

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

CALL RESIGNATION

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

**EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT**

The evaluation criteria in the extraordinary call will be:

- A written test formed by the following characteristics:

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

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

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

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

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

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

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

REQUIREMENTS to pass the subject

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

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

CALL RESIGNATION

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

## MANDATORY MATERIALS

Collections of problems and specific questions related to the subject.

## BIBLIOGRAPHY

### Basic bibliography

NOMENCLATURE OF INORGANIC CHEMISTRY

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**Journals**

**Web sites of interest**

http://www.egela.ehu.es

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

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

**OBSERVATIONS**

Universidad del País Vasco — Euskal Herriko Unibertsitatea

**COURSE GUIDE** 2024/25

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

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

## COURSE

28122 - Introduction to Mechanics **Credits, ECTS:** 6

## COURSE DESCRIPTION

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## COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

La Mecánica servirá para ampliar el sentido físico del alumnado.El objetivo es desarrollar la capacidad analítica de dividir un problema en partes más sencillas, para una vez entendidas las partes poder resolver el problema en su conjunto.
1. Magnitudes vectoriales y escalares
Operaciones entre vectores
2. Geometría de masas
3. Estática
4. Cinemática. Análisis cinemático de mecanismos planos
5. Dinámica, problema inverso/directo.

## Theoretical and Practical Contents

1. Magnitudes vectoriales y escalares
Operaciones entre vectores
2. Geometría de masas
3. Estática
4. Cinemática. Análisis cinemático de mecanismos planos
5. Dinámica, problema inverso/directo.

## TEACHING METHODS

gg

## 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

- Exercises, cases or problem sets 90%
- Teamwork assignments (problem solving, Project design) 10%

## ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

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## EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

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## MANDATORY MATERIALS

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## BIBLIOGRAPHY

### Basic bibliography

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### Detailed bibliography

gg

### Journals

gg

### Web sites of interest

gg

## OBSERVATIONS

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Universidad del País Vasco Euskal Herriko Unibertsitatea

**COURSE GUIDE** 2024/25

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

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

## COURSE

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

## COURSE DESCRIPTION

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

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

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

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

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

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

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

## COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

The following course skills are developed:

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

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

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

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

## Theoretical and Practical Contents

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

Theoretical content (chapters):

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

Practical content:

The students will perform 17 or 18 laboratory experiments.

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

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

Attendance to the laboratory sessions is compulsory.

## TEACHING METHODS

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

The course objectives are:

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

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

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

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

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

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

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

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

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

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

The student will be able:

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

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

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

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

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

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

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

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

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

- Public presentation of the project

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

- Evaluation sheet
- Final Opinion survey

## TYPES OF TEACHING

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

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

## Evaluation methods

- End-of-course evaluation

## Evaluation tools and percentages of final mark

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

## ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

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

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

More specifically explained:

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

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

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

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

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

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

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

SOME REMARKS:

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

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

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

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

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

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

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

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

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

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

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

## EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

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

## MANDATORY MATERIALS

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

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

## BIBLIOGRAPHY

### Basic bibliography

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

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

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

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

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

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

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

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

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

**Detailed bibliography**

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

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

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

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

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

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

**Journals**

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

**Web sites of interest**

- Hydraulic Institute. www.pumps.org
- Pump-Flo Co. www.pump-flo.com/manulist.asp
- Animated software company, www.animatedsoftware.com
- Pumps and systems magazine: www.pump-zone.com.
- http://www.sc.ehu.es/sbweb/fisica/fluidos/estatica/introduccion/Introduccion.htm.
- National Committee for Fluid Mechanics Films (NCFMF) http://web.mit.edu/fluids/www/ Shapiro/ncfmf.html
- IIHR- Hydroscience & Engineering, College of Engineering, The University of Iowa. http://www.iihr.uiowa.edu/:
- Enciclopedia básica sobre fluidos: http://hyperphysics.phy-astr.gsu.edu/ hbase/ fluid.html#flucon
- Principios de aeronáutica: http://wings.avkids.com/Libro/advanced.html
- Simulación de redes de distribución de fluidos: http://www.epa.gov/nrmrl/wswrd/dw/epanet.html

- UNESCO-IHE Institute for Water Education: http://www.unesco-ihe.org/
- Manual de vuelo: http://www.inicia.es/de/vuelo/

## OBSERVATIONS

Tutorials: The students have a schedule of tutorials to deal with all issues related to the subject. Its use is encouraged to support the acquisition of the competences of the subject with the close support of the teacher, who is available to attend and help students. Outside the tutoring hours there will be no problem in attending students, whenever possible. It is recommended by appointment.

Universidad del País Vasco — Euskal Herriko Unibertsitatea

**COURSE GUIDE** 2024/25

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

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

## COURSE

26031 - Basic Programming **Credits, ECTS:** 6

## COURSE DESCRIPTION

The subject of Basic Programming introduces students to the field of software development. This subject is the first step in the training of students in the development of programs in the degree course.

The main goals of this module are:
1. Learn the application developmen methodology: specification, algorithm design following a top-down approach and implementation.
2. Learn to document the solution following the methodology.
3. Be abble to deal with problems that require working with lists and data sequences.
4. Be able to understan and use the main programming structures:
   a. Control structures: sequential, conditional and iterative structures.
   b. Functions and procedures.
   c. Data structures.
5. Implement the structures in a particular language: Java.

## COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

The competences to be acquired in the subject are:

- Ability to analyse and explain the behaviour of programs that contain: instructions, I/O operations, iteration, sub-programs.
- Ability to divide a problem into logical parts that can be solved (programmed) independently.
- Ability to design simple algorithms to solve problems, implement them, test them and fine-tune them. Ability to write code in accordance with rules of good practice.
- Knowledge, design and efficient use of the most suitable types and structures of data for problem-solving.
- Knowledge of basic algorithmic procedures in IT technologies for design solutions to problems, analysing the suitability and complexity of the algorithms proposed

## Theoretical and Practical Contents

1.- Introduction
This chapter introduces programming, focusing on the methodology that entails several steps (specification, algorithm design, implementation and test). It highlights the importance of the algorithm design.

2.- Elementary concepts for programming
Throughout this chapter, the student will learn the basics of algorithm design and programming.

3.- Functions and procedures
In this chapter the student will learn to design and implement subprograms.

4.- Control structures and algorithm templates
This chapter covers the conditional and iteravi structures. In addition, the main algorithm templates will be presented.

5.- Data structures
This chapter presents the mechanisms to define complex data structures and lists.

## TEACHING METHODS

During lectures, explanations of concepts will be combined with the performance of exercises.
In the laboratories, a set of exercises distributed in advance will be implemented in pairs and must be handed in for evaluation. The sessions require a previous preparation work on these exercises.
In some laboratories individual controls will be carried out to verify the assimilation of the contents taught so far.

## TYPES OF TEACHING

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

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

## Evaluation methods

- Continuous evaluation
- End-of-course evaluation

## Evaluation tools and percentages of final mark

- Written test, open questions 55%
- Exercises, cases or problem sets 20%
- Individual assignments 25%

## ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Assessment in the ORDINARY call will be done under continuous assessment or final assessment. By default, all students will do continuous assessment unless they withdraw from it.

* FINAL ASSESSMENT
The student may withdraw from continuous assessment to do final assessment (final exam). This withdrawal will be presented in writing to the professor responsible for the subject in the periods established in Article 8 of the Rules on Assessment of Students. Exceptional cases will not be accepted, nor can students withdraw from continuous assessment after the stated dates.

* CONTINUOUS ASSESSMENT

The final grade of the subject is calculated on the basis of the exam marks (55%), laboratory work (35%) and individual practical tests (25%).

* GRADING IN MINUTES:

Students who have not withdrawn from continuous assessment will be considered as presented for the ORDINARY call.

To pass the subject, the student must take all the exams and obtain a minimum final grade of 5 out of 10. The student must also score at least 3 out of 10 and 4 out of 10 in the grade corresponding to the exams, and a weighted average of 4.5, in order to take into account the laboratory and practical work grades. Otherwise, the grade obtained will the average marks of the exams.

* WITHDRAWAL FROM THE EXAM
A student who, having opted for final assessment, does not present him/herself for the ORDINARY call will be graded as "NOT PRESENTED". A student who takes continuous assessment may withdraw from the call as per stipulated in Article 12 of the Rules on Student Assessment.

* CASES OF COPYING/PLAGIARISM
Article 11 of the current rules on student assessment will be applied. Any student involved in a plagiarism/copying case will automatically fail the ordinary call

## EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The evaluation of the course in the EXTRAORDINARY call is done by means of a final evaluation.
The exam evaluates the theoretical and practical knowledge developed during the course.

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

* CASES OF COPYING/PLAGIARISM
Article 11 of the current rules on student assessment will be applied. Any student involved in a plagiarism/copying case will automatically fail the extraordinary call

## MANDATORY MATERIALS

Course material in egela

## BIBLIOGRAPHY

### Basic bibliography

"Una Introducción a la programación. Un enfoque algorítmico". J.J.Garcia, F.J. Montoya,J.L Fernandez, M.J. Majado
Thomson Ed. 2005
"Oinarrizko Programazioa. Ariketa-bilduma" Díaz de Ilarraza A., Sarasola K.
Udako Euskal Unibertsitatea, 1999.

### 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

Universidad del País Vasco — Euskal Herriko Unibertsitatea

**COURSE GUIDE** 2024/25

| | | | |
|---|---|---|---|
| **Faculty** | 163 - Faculty of Engineering - Vitoria-Gasteiz | **Cycle** | . |
| **Degree** | GIAUTO10 - Bachelor's Degree in Automotive Engineering - DUAL | **Year** | Second year |

## COURSE

28125 - Electrical Circuit Analysis — **ECTS Credits:** 6

## COURSE DESCRIPTION

The compulsory subject "Electrical Circuit Analysis" is taught in the first semester of the second year of the Degree in Automotive Engineering. The subject will provide students with knowledge and tools to analyse the operation of electrical and magnetic circuits.
In this subject, calculation tools are used, such as complex numbers and systems of linear equations, which have been studied in the subjects of Calculus and Algebra. In addition, the knowledge acquired in the ICT Fundamentals subject will be useful to solve circuit analysis exercises with the help of computers.
The skills and learning results obtained in this subject will be applied in the 2nd semester subjects of the same course: Electric Machines and Traction, Vehicle Systems Control and Driving Assistance Systems and Automotive Electronics; and also in the 3rd year: Automotive Instrumentation, Hybrid and Electric Vehicles and Integration and Storage of Electrical Energy in Automotive Systems.

## COMPETENCIES/LEARNING OUTCOMES FOR THE SUBJECT

Competencies:
· Knowledge and use of the principles of electromagnetism and circuit theory.

Learning outcomes. Students will:
· Apply knowledge of the fundamentals of electromagnetism, circuits and electricity in situations specific to the industrial field and in the subsequent learning of advanced theories.
· Solve the problems of the subject, through qualitative and quantitative analysis, the approach of hypotheses and the proposal of solutions, using the appropriate electrical models.
· Prepare written and oral works and reports adequately expressing theoretical knowledge, methods of resolution and results, using the vocabulary, forms of representation and specific terminology of Electricity.
· Formulate ideas, debates proposals and make decisions in cooperative work.
· Show a critical spirit and interest in learning.
· Develop designs and projects.
· Apply mandatory legislation, specifications, regulations and standards.
· Analyse and assess the social and environmental impact of technical solutions by applying sustainability criteria.
· Apply quality principles and methods.

## Theoretical and Practical Content

Topic 1. Introduction to circuit theory
· Variables and elements of electrical circuits
· Kirchhoff's Laws and Ohm's Law
· Power and energy. Power balance
· Transient state
· Methods and theorems for solving circuits in steady state

Topic 2. Alternating current circuits
· Phasor analysis
· Behaviour of passive components in alternating current
· Resolution of circuits in sinusoidal steady state
· Active, Reactive and Apparent Power. Complex Power
· Reactive power compensation. Billing
· Harmonic distortion

Topic 3. Three-phase circuits
· Description of three-phase systems
· Resolution of three-phase circuits
· Calculation and measurement of power in three-phase systems

Topic 4. Electromagnetism
· Magnetomotive force, field and magnetic flux
· Reluctance. Hopkinson's Law. Magnetic circuits
· Self-induction coefficient of a coil
· Coupled coils

## TEACHING METHODS

The subject is taught following a mixed methodology, both with master classes and active methodologies designed to

stimulate student participation, initiative, collaborative work, debate and critical analysis. The students will apply the knowledge acquired in the master classes through the activities proposed in the classroom and in the laboratory.
The 4 sections of the syllabus will be performed through the following teaching tools:
· Application exercises to be done during class time.
· Collection of exercises to do outside class hours.
· Individual questionnaires on the concepts explained in class.
· Assembly of circuits in the laboratory and practice sheets.
· Computer simulations.
· Crossed questions.
· Oral presentations.
Tutorials, both individual and group, are used to resolve doubts, guide work and exercises, propose improvements, etc. In general, tutoring is a voluntary activity at the request of the students.

## TYPES OF TEACHING

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

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

## Assessment methods

- Continuous assessment
- End-of-course assessment

## Assessment tools and percentages of final mark

- Exams: 30%
- Continuous assessment: 20%
- Laboratory practices: 30%
- Projects: 10%
- Presentations: 10%

100%

## ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Continuous Assessment System:
The Ordinary Call is evaluated, by default, through the Continuous Assessment System. The mark of the continuous assessment is divided into 3 blocks.
· Block A: Classroom work.
· Block B: Laboratory practices.
· Block C: Deliverable work and presentation.
Assessment block A is made up of 2 partial assessments:
· A1: Corresponds to topic 1.
· A2: Corresponds to the rest of the topics.
Block A is evaluated through written tests (multi-choice questions and exercises on paper and on the computer) and questionnaires (in eGela) and represents 60% of the final mark.
Block B is evaluated with laboratory practices (execution and deliverable sheets) and represents 30% of the mark.
Block C is evaluated based on the delivery and oral presentation of a piece of work. It represents 10% of the final mark.
To pass the subject, it is necessary to pass blocks A and B with a minimum mark of 5. Otherwise, the student will be failed with the weighted average mark limited to a maximum of 4.5.
To pass block A, in addition to obtaining a 5 or more in the weighted average of the partial exams A1 and A2, a minimum mark of 2.5 must be obtained in both partial exams. Should this not be the case, the student will be failed with the weighted average limited to a maximum of 4.5.
The partial assessments and blocks passed during the continuous assessment will be saved during this course.

Final Assessment System:
Students will have the right to be evaluated through a final assessment test, regardless of whether or not they have participated in the continuous assessment system. To exercise this right, the student must submit the opting out to the continuous assessment system in writing to the teaching staff responsible for the subject up to one month before the end date of the teaching period for the subject.

Opting out of ordinary call:
Failure to attend the test set on the official exam date will mean automatic opting out of the ordinary call, which will be marked as "No show".

Non-face-to-face modality due to health issues:
In the event of health issues preventing the carrying out of a teaching activity and/or in-person assessment, a non-face-to-face modality will be activated of which the students will be promptly informed.

## EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Students who do not pass the subject in the ordinary call, regardless of the assessment system chosen, will have the right to take the final test of the extraordinary call.

Opting out of extraordinary call:
Failure to attend the test set on the official exam date will mean automatic waiving the right to the extraordinary call, which will be marked as "No show".

Non-face-to-face modality due to health issues:
In the event of health issues preventing the carrying out of a teaching activity and/or in-person assessment, a non-face-to-face modality will be activated of which the students will be promptly informed.

## MANDATORY MATERIALS

Teaching material available on the eGela platform.

## BIBLIOGRAPHY

### Basic bibliography

Jesús Fraile Mora. *Circuitos eléctricos*. 2ª Edición. Ibergarceta publicaciones, 2019.
Antonio Pastor Gutiérrez y otros. *Circuitos eléctricos* (Vol 1). UNED.
Itziar Zubia Olaskoaga, Elena Monasterio Iruretagoyena, Luis Mª Bandrés Unanue, Puy Arruti Martínez. *Teoría de Circuitos*. UPV/EHU, 2009.
Jesús Fraile Mora. *Máquinas eléctricas*. 6ª Edición Mc Graw Hill.

### Detailed bibliography

Félix Redondo Quintela y Roberto C. Redondo Melchor. *Redes eléctricas de Kirchhoff*. 3ª edición. STS Ediciones.
Félix Redondo Quintela. *Redes con excitación sinusoidal*. Ed. REVIDE, S.L. Salamanca, 1997.
Félix Redondo Quintela, Juan Manuel García Arévalo, Roberto C. Redondo Melchor. *Prácticas de Circuitos Eléctricos*. Ed. REVIDE, S.L. Salamanca, 2009.
Puy Arruti Martínez, Elena Monasterio Iruretagoyena, Luis Mª Bandrés Unanue, Itziar Zubia Olaskoaga. *Teoría de Circuitos. Ampliación*. UPV/EHU, 2009.
Steven T. Karris, *Circuit Analysis I with MATLAB® Computing and Simulink® / SimPowerSystems® Modeling*. Orchard Publications, Fremont, California. 2009.
UNE-EN IEC 60375:2018. "Convenios relativos a los circuitos eléctricos y magnéticos".

### Journals

*IEEE Transactions on Circuits and Systems* (www.ieee-cas.org)
*International Journal of Circuit Theory and Applications*

### Web sites of interest

Mathworks (matlab):
https://es.mathworks.com/
GNU/Octave:
https://octave.org/
Jupyter:
https://jupyter.org/
Openmodelica:
https://openmodelica.org/
Circutor:
https://circutor.com/
Som energia:
https://www.somenergia.coop/es/
Iberdrola (información sobre energía reactiva):
https://www.iberdrola.es/comunidades/informacion/energia-reactiva
Redeia - red eléctrica:
https://www.ree.es/es/
Fundamentos de Ingeniería Eléctrica, Canal UNED:
https://canal.uned.es/series/5a6f4e5db1111fa3378b4569

## OBSERVATIONS