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

<table>
<thead>
<tr>
<th>FACULTY OF ENGINEERING – GIPUZKOA (263 )</th>
<th>SEMESTER</th>
<th>CREDITS</th>
<th>SCHEDULE¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>25980 Fundamentos de Tecnología Eléctrica</td>
<td>Annual</td>
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<tr>
<td>25974 Fundamentos Físicos de la Ingeniería</td>
<td>Annual</td>
<td>12</td>
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<td>26597 Seguridad y Legislación</td>
<td>Sep. 2020- Jan. 2021</td>
<td>6</td>
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<td>26556 Prevención y Seguridad en el Trabajo</td>
<td>Sep. 2020- Jan. 2021</td>
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<tr>
<td>25999 Informática Industrial</td>
<td>Sep. 2020- Jan. 2021</td>
<td>6</td>
<td>M</td>
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<tr>
<td>26534 Física Aplicada</td>
<td>Sep. 2020- Jan. 2021</td>
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<td>25975 Fundamentos Químicos de la Ingeniería</td>
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<tr>
<td>26532 Acústica Arquitectónica</td>
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<tr>
<td>26587 Acústica</td>
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<td>6</td>
<td>A</td>
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<tr>
<td>26555 Introducción a la prevención, seguridad, salud y proyectos técnicos</td>
<td>Jan. 2021- May 2021</td>
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<tr>
<td>25998 Robótica</td>
<td>Jan. 2021- May 2021</td>
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<thead>
<tr>
<th>FACULTY OF ENGINEERING- GIPUZKOA- EIBAR DEPARTMENT (264 )</th>
<th>SEMESTER</th>
<th>CREDITS</th>
<th>SCHEDULE</th>
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<tr>
<td>27859 Estática y Resistencia de Materiales</td>
<td>Sep. 2020- Jan. 2021</td>
<td>6</td>
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<tr>
<td>25986 Sistemas de Gestión Integrada</td>
<td>Sep. 2020- Jan. 2021</td>
<td>6</td>
<td>M</td>
</tr>
<tr>
<td>27875 Eficiencia Energética</td>
<td>Sep. 2020- Jan. 2021</td>
<td>6</td>
<td>M</td>
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<tr>
<td>27850 Cálculo</td>
<td>Sep. 2020- Jan. 2021</td>
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<tr>
<td>25989 Organización, Gestión y Administración de Empresas</td>
<td>Jan. 2021- May 2021</td>
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<td>M</td>
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<td>27877 Energía Solar Termoeléctrica</td>
<td>Jan. 2021- May 2021</td>
<td>6</td>
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<tr>
<td>27862 Transferencia de Calor</td>
<td>Jan. 2021- May 2021</td>
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<tr>
<td>27861 Matemática Estadística</td>
<td>Jan. 2021- May 2021</td>
<td>6</td>
<td>M</td>
</tr>
</tbody>
</table>

¹ SCHEDULE: Morning (M)/ Afternoon (A): begins at 13:30. M/A means that these subjects might have several classes in the afternoons for some weeks during the semester. By clicking the subject’s name, its Syllabus will appear.
COURSE GUIDE 2020/21

Faculty 263 - Faculty of Engineering - Gipuzkoa
Degree GIEIAU20 - Bachelor's Degree in Industrial Electronics and Automation Engine
Cycle Not Applicable
Year Third year

COURSE 25999 - Industrial Information Technology
Credits, ECTS: 6

COURSE DESCRIPTION
Industrial Information Technology is a fairly wide term that involve any computer system applied in industrial environments. Since the area is so wide, the course is constrained to the use of computers to control and monitor industrial systems in general, bearing in mind the issues of designing proper Human-Machine Interfaces for those systems, of taking care of the Data Acquisition and signal generation needed for these purposes, of making communications possible between computers of the industrial plant and, finally, being able to program industrial (and not industrial) computers.

The main tool the student will use to learn about this subject is LabVIEW, a graphical programming language specially designed by and for engineers.

It is strongly recommended that the students have passed basic computer science courses (such as 25977) as well as control and automation courses (26511) before starting the present course.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT
(TEEOI10) Industrial Information Technology and communications
(C3) Basic technology
(C4) Problem solving
(C5) Measuring and reporting
(C10) Multilingual / Multidisciplinary work environments
(C13) Scientific methodology

And the expected learning results are these:

- To be able to interpret technical documents
- To design Control and Supervisory systems
- To analyse industrial systems
- To design and implement informatics systems for the industry

We will also tackle some transversal competences, ask the teachers if you need further information. The UPV/EHU Catalogue of Transversal Competences has not been translated yet, but it is available in Spanish in the following link:

https://www.ehu.eus/documents/1432750/12757375/Cat%C3%A9logo+de+Competencias+trasversales_cas.pdf

COURSE CONTENTS, THEORETICAL & APPLIED
1. Industrial IT in our industrial environment
2. LabVIEW basics
3. Communications and the Cloud
4. LabVIEW programming
5. Real Time Systems and Embedded Systems
6. LabVIEW developing

TEACHING METHODS
The aim of the course is to make the students learn in a gradual way, in order to be able to design and implement industrial applications of some complexity. The methodology to achieve this gradual learning is mainly stressed with the practical tests: three increasingly demanding tests, from simple to complex, that the student must pass during the regular term period.

It is important to make clear that the goal of the tests is not to check if the students are able to employ the programming tool (LabVIEW). The goal is to check if the student is able to analyze and design industrial informatics applications (using the proposed tool).

If none of the students can attend the lessons (for example, due to COVID-19 social distancing measures), the teachers will make possible to do all the tasks remotely. They could also replace the practical tests with other ways to assess.
### TYPES OF TEACHING

<table>
<thead>
<tr>
<th>Types of teaching</th>
<th>M</th>
<th>S</th>
<th>GA</th>
<th>GL</th>
<th>GO</th>
<th>GCL</th>
<th>TA</th>
<th>TI</th>
<th>GCA</th>
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<tbody>
<tr>
<td>Hours of face-to-face teaching</td>
<td>30</td>
<td>30</td>
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<tr>
<td>Hours of student work outside the classroom</td>
<td>30</td>
<td>60</td>
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**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 tools and percentages of final mark

- Continuous evaluation
- End-of-course evaluation

### Evaluation methods

- Exercises, cases, or problem sets 20%
- Teamwork assignments (problem solving, Project design) 20%
- Practical tests 60%

### ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

In a nutshell, the subject has five evaluation items and the student needs to get 50% of the points in each item to pass the course.

The items are the following:

1. - LabVIEW Basics practical test (week 6) 20%
   This test will be held in the laboratory during the regular practical sessions. There would be an extra chance to pass this test in the official exam date.

2. - Programming in LabVIEW practical test (week 11) 20%
   This test will be held in the laboratory during the regular practical sessions. There would be an extra chance to pass this test in the official exam date.

3. - Developing in LabVIEW practical test (official exam date) 20%
   This test will be held in the laboratory in the official exam date.

4. - Group work on industrial applications (week 8) 20%
   The details of this work will be explained beforehand.

5. - Report of the laboratory sessions (two days before the official exam date) 20%
   The student will report on the work done during the laboratory sessions.

The student must pass all the parts to pass the course.

Students who want to avoid the continuous assessment method or to avoid sitting the exam should follow current regulations. Do not hesitate to contact the coordinator of the course if you have any question about the assessment.

### EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The considerations of the regular call apply to the extraordinary call too. The only exception is that the deadline of the individual work and the report is two days after the official exam date instead of two days before. The parts passed in the first call are kept for the second call.

### MANDATORY MATERIALS

Documents available in eGela. If you have any issue accessing eGela, just ask the teachers.

It is strongly recommended to install LabVIEW 2019 in your own laptop. The UPV/EHU has a student license available (https://www.ehu.eus/liz/niacademic/).
BIBLIOGRAPHY

Basic bibliography
egele.ehu.eus

Detailed bibliography
- Absolute Beginner's guide to C. Greg Perry. SAMS.

Journals
Revista Iberoamericana de Automática e Informática Industrial RIAI
ISSN: 1697-7912
http://www.journals.elsevier.com/revista-iberoamericana-de-automatica-e-informatica-industrial-riai/

IEEE Transactions on Industrial Informatics
ISSN 1551-3203
http://tii.ieee-ies.org/

Computers & Industrial Engineering
ISSN: 0360-8352
http://www.journals.elsevier.com/computers-and-industrial-engineering

Web sites of interest
https://informatics.industriainformatika.pw/
http://www.ni.com/
http://blog.eyesonvis.com/
https://www.isa.org/isa101/
http://www.iiconsortium.org/

OBSERVATIONS
This course is part of the English Friendly Course (EFC) programme, so foreign students should not have issues following the subject if they command English. The teachers have the right to be flexible with the deadlines and assessment methods for EFC students, because we do not want EFC students to struggle because of language barriers. EFC students are very welcome to our course.

The subject has some strong requirements with regards to the vision and motor skills (use of the mouse, writing). In consequence, any student with permanent or temporary difficulties in this sense should contact the coordinator of the subject.

In this sense, if any student has issues with the lecture notes, handouts, or the language, it is recommended to contact the coordinator of the subject.

The practical sessions will be held in the Control Laboratory, in the absence of other indications.

Coordinator of the subject for the 2020/21 term: Aitzol Ezeiza
Applied Physics is one of the basic subjects in the 1st year of the Degree of Technical Architecture. It is included in the module called Scientific Foundations.

In the field of building engineering, one of the most important questions is the structural stability of the buildings, whose elements suffer different forces and tensions. In this subject, the physical foundations of Statics are studied, with their subsequent application in simple structures. This is compulsory to be able to understand structures that are more complex in the future.

As a prerequisite, it is important the student's knowledge about basic issues such as unities, orders of magnitude and scale, or the concept of density. Furthermore, the student should be very familiar with the operations with vectors to apply Newton's equations, sketching force diagrams and solve different questions on basic statics.

Competences of the subject:
C1. Apply the vectorial calculus for the solving of problems of statics of structural systems, be they by analytical methods or graphical methods.
C2. Apply the physical concepts related to internal stresses of the body, analyzing and solving basic problems on triangular structures and beams.
C3. Use simple experimental devices. Discuss and analyze results obtained experimentally, being able to interpret these results in the conceptual context developed in the subject.

In addition to this, the following cross-competences will be developed (these competences, common to different subjects, are worked in the subject of Applied Physics along with the specific competences of the subject).
T1. Problems solving. Employ coherently the procedimental knowledge associated to the scientific methodology for the solving of problematic situations in basic physics; perform quantitative analysis, express hypothesis, prepare alternative strategies, resolve and analyze results.
T2. Working in group. In order to face with mates cooperative tasks in the context of physics: propose strategies, analyze the contributions of others, discuss ideas and execute the corresponding actions.
T3. Written communication: reports. Work with information related to processes of basic physics, analyze and express correctly ideas, using for this different systems of symbols or forms of representation: text, formulae, tables, graphs and diagrams.

The chapters that will be developed along the year are the following:
1. Introduction. Social and environmental impact of building.
2. Particle statics
3. Forces applied on the rigid body
4. Statics of the rigid body
5. Gravitational centers
6. Graphical statics
7. Isostatic triangular structures on the plane
8. Intern forces of isostatic beams

Along the year, several practice sessions will be conducted in the lab, in which the concepts of force decomposition, the static or kinetic nature of frictional forces, the axial forces in a triangular structure, as well as the importance of considering and estimating experimental errors will be analyzed experimentally.
TEACHING METHODS
Along the year, several practice sessions will be conducted in the lab, in which the concepts of force decomposition, the static or kinetic nature of frictional forces, the axial forces in a triangular structure, as well as the importance of considering and estimating experimental errors will be analyzed experimentally.

With the proposed methodology, we try to foster the continuous work of the student, in such a way that he/she acquires the competences and assimilates the concepts in a progressive way. We will follow a textbook in the majority of the chapters of the subject. In each chapter, the student will know which points are going to be analyzed in class thanks to guide-sheets, uploaded in the virtual platform eGela. The concepts are explained in class, and after an open problem related to the explained concepts is proposed. The students work on this problem individually or in pairs, and they deliver the task at the end of the class (sometimes it will be homework). The different solving strategies are commented, in addition to the errors that may have been detected. These tasks contribute to the continuous evaluation.

Furthermore, in order that the student have a realistic valuation of his/her own progress, three controls will be established along the semester, each of which contributes to the final score. The content of each control as well as its weighting in the evaluation increases gradually. Moreover, the student must attend practice sessions and elaborate the corresponding reports, which also contribute to the final score.

TYPES OF TEACHING

<table>
<thead>
<tr>
<th>Types of teaching</th>
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<th>GA</th>
<th>GL</th>
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<th>GCL</th>
<th>TA</th>
<th>TI</th>
<th>GCA</th>
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<tbody>
<tr>
<td>Hours of face-to-face teaching</td>
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<td>75</td>
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</tbody>
</table>

Legend:
M: Lecture-based  S: Seminar  GA: Applied classroom-based groups
TA: Workshop  TI: Industrial workshop  GCA: Applied fieldwork groups

Evaluation methods
- End-of-course evaluation

Evaluation tools and percentages of final mark
- Written test, open questions 80%
- Exercises, cases or problem sets 10%
- Laboratory practices 10%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT
There exist two possibilities to be evaluated: (1) follow the continuous evaluation (2) choose a final exam. The student that wants to withdraw from the examination and choose the final exam must let the professor know by writing before the 11th week of the semester. He/she must fill the corresponding form available in eGela.

In the evaluation, a maximum score of 100 points can be obtained; if the student achieves 50 points and fulfills the requirements mentioned below, he/she will pass the subject. The evaluation will be carried out by means of the following activities:

(1) CONTINUOUS EVALUATION METHOD:

- Evaluation activity: additional tasks, problems, etc. (along the semester)
  Points: 10% of the final mark.
  Observations: Not to fill the tasks before the fixed date without any justification implies a zero in this task. Part of the tasks will be on-site. This task will be carried out when the professor considers. To pass the subject with a continuous evaluation, a minimum of 10/25 of the tasks is required. Otherwise, the student will fail and he/she will have to attend the extraordinary exam.

- Evaluation activity: laboratory practices (along the semester)
  Points: 10% of the final mark
  Observations: It is necessary to pass them. For that, the assistance is compulsory, and the corresponding reports must be delivered correctly (more details in the eGela platform).

- Evaluation activity: 1st control (approximately the first 5 weeks of classes)
  Points: 15% of the final mark
  Observations: No contents can be compensated after.

- Evaluation activity: 2nd control (approximately the first 10 weeks of classes)
  Points: 25% of the final mark
Observations: No contents can be compensated after.

Evaluation activity: 3rd control (at the final of the semester)
Points: 40% of the final mark
Observations: all the content of the semester. It is necessary to achieve 3.5 out of 10 points to have the rest of the activities taken into account in the continuous evaluation.

NOTES AND REQUISITES:

It is compulsory to pass the laboratory practices to pass the subject. For that, the assistance is also compulsory and all the reports must be delivered correctly. For those who do not pass the laboratory practices, an exam that assess the competences will be carried out in the extraordinary exam.

(2) FINAL EXAM EVALUATION METHOD

In case of doing a final exam the same date of the 3rd control of the continuous evaluation, both exams will be different. The final grade will be obtained as follows:
- 10% laboratory practices (minimum 5 out of 10)
- 90% Individual written exam

In case the student does not attend the exam in the official date, it will be considered as "not presented".

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

- 10% laboratory practices (minimum 5 out of 10)
- 90% Individual written exam

The evaluation is performed by means of a final exam. Those students that have not passed the laboratory practices will have the opportunity to do a practice the same day of the exam (its weight will be 10% of the final mark). All these students will do the practice part in groups, like during the semester.

For the students who have follow the continuous evaluation, it is possible to maintain the grade obtained in the different activities (tasks, controls 1 and 2 and laboratory practices) so that in the extraordinary exam the same criteria and percentages are applied (60% continuous evaluation, 40% control over all the contents). For this, they will have to let the professor know at least 10 days before the official date of the exam.

No es necesario renunciar a la convocatoria extraordinaria si no se quiere que corra convocatoria, basta con no presentarse al examen.

MANDATORY MATERIALS

Material for drawing in the chapter of graphical statistics

BIBLIOGRAPHY

Basic bibliography

Detailed bibliography

Journals

Web sites of interest
http://ocw.mit.edu/courses/architecture/4-440-basic-structural-design-spring-2009/
http://ocw.mit.edu/courses/civil-and-environmental-engineering/1-050-solid-mechanics-fall-2004/

OBSERVATIONS
The subject 'Fundamentals of Chemical Engineering' is, together with other basic subjects, a support to Engineering. It helps to understand many phenomena of the world that surrounds us being present both in nature and in industry. Through chemistry not only new processes are discovered, also we try to know why and how they work, and how they can be improved and controlled. In addition, it is a great tool to tackle environmental problems.

In this subject, chemistry, organic and inorganic nomenclature will be reviewed, the basic theoretical concepts that allow the students to understand the nature of matter, from atomic structure to the main types of intramolecular bond (ionic, covalent and metallic) will be introduced, as well as intermolecular interactions that define the macroscopic properties of matter and its three states of aggregation. The fundamentals of chemical kinetics and thermodynamics necessary in order to understand the reactions and chemical equilibria will be provided.

In this course basic and necessary principles are developed to meet and understand other subjects: Materials Science (2nd year) and Environmental Technologies (4th year), common for all grades of Industrial Engineering. There are no prerequisites for this course. It is recommended to have studied Chemistry in high school and have basic knowledge of organic and inorganic chemical nomenclature and physicochemical magnitudes and units.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

GENERAL SKILLS:
G-1 Adopt a responsible attitude and orderly work habits and tackle with motivation and interest the difficulties that arise in the learning process.
G-2 Teamwork, integrating skills and knowledge to take decisions on the development of the proposed tasks.
G-3 Autonomous learning.
G-4 Ability to manage information.
G-5 Oral and written communication.
G-6 Prepare reports.

SPECIFIC SKILLS
S-1 Develop knowledge and understanding of the basic principles of general chemistry and its applications.
S-2 Apply the strategies of the scientific method to solve problems of general chemistry at a theoretical and experimental level.
S-3 Be able to explain in a comprehensively way phenomena and processes of everyday life related to basic aspects of Chemistry.
S-4 Analyze problems, make decisions and use equations and models suitable for resolution.
S-5 Develop the capacity of oral and written communication, transmit knowledge and results using the language and specific terminology of Engineering and Chemistry.
S-6 Develop good laboratory practices by safe handling of chemicals and generated wastes and properly assessing the risks of handling chemicals.

LEARNING OUTCOMES
O-1 Name and write formulas of chemical compounds.
O-2 Explain and interpret the atomic models.
O-3 Relate the electron configuration of the atom with its position in the periodic table, its properties and type of bond.
O-4 Balance equations and make stoichiometric calculations.
O-5 Relate the type of chemical bond with the properties of substances.
O-6 Relate the intermolecular bonding with the states of aggregation of matter.
O-7 Describe the main properties of gases, liquids and solids.
O-8 Apply the basics of chemical kinetics to the study of the reaction rate.
O-9 Enunciate the thermodynamic laws and apply them to the energy study of chemical reactions.
O-10 Explain the concept of chemical equilibrium and how different factors affect the evolution of the state of equilibrium.

COURSE CONTENTS, THEORETICAL & APPLIED

Unit 1: Compounds and fundamental concepts.
Chemical nomenclature of inorganic compounds. Chemical nomenclature of organic compounds. Basic concepts and stoichiometry. Physical properties of the compounds. Concentration of the solutions.
Unit 2: Atomic structure.
Unit 3: Chemical bonding.
Unit 4: Physical states and properties of matter. 
Solid state. Liquid state. Gas state. 
Unit 5: Classical thermodynamics. 
Unit 6: Thermochemistry. 
Unit 7: Spontaneity and free energy. 
Unit 8: Equilibria. 

PRACTICES 
Practice 1: Safety standards and laboratory work. 
Practice 2: Preparation of solutions. 
Practice 3: Calorimetry. 
Practice 4: Chemical kinetics. 
Practice 5: Chemical equilibrium. 
Practice 6: Acid base titration. 

TEACHING METHODS 
Theory class (1): 
The main objectives of the subject will be clearly stated, the subject contents will be explained and problems, that help students to better understand the meaning of the concepts, will be resolved. 
Classroom practices (2): 
Resolution of issues and problems individually or in groups led by the lecturer. 
Laboratory practices (3): 
Experimental laboratory activities related to the subject, developed in the laboratory under the supervision of the lecturer. 
Evaluation and training activities: 
Two tests of individual assessment will be carried out in each semester. 
Evaluation questionnaires are supplied to the students through the virtual classroom. 

(1) It will allow the acquisition of skills: G-3 G-5, S-1, S-2, S-3, S-4 and S-5. 
It will be made available to students the material necessary for their understanding. 
(2) It will allow the acquisition of skills: G-1, G-2, G-3, G-4, G-5, G-6, S-1, S-2, S-3, S-4 and S -5. 
(3) It will allow the acquisition of skills:: G-2, G-3, G-4, G-5, G-6, S-5 y S-6. 

TYPES OF TEACHING 

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<tbody>
<tr>
<td>Hours of face-to-face teaching</td>
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<td>15</td>
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<tr>
<td>Hours of student work outside the classroom</td>
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<td>45</td>
<td>22,5</td>
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Evaluation methods
- End-of-course evaluation 

Evaluation tools and percentages of final mark
- Written test, open questions  80% 
- Exercises, cases or problem sets  20% 

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT 
In this subject the system of continuous assessment is used. It will consist of: 
1.- Two tests of individual assessment in each quarter. Each test will consist of a written exam including theoretical issues (concepts, definitions, etc), and theoretical and practical questions related to the application of theoretical knowledge. 
One of the tests will be done in the middle of the four-month period (mid-term test) and will be liberatory if the student earns a grade of 6.5/10. At the end of the quarter a second test will be held in the period set in the academic calendar of the center. The student will pass this test with a minimum grade of 5/10 (for both students who have liberated matter in the mid-term test or not). 
The computation of the tests in the final grade will be:
- If the student liberates matter in mid-term tests, 20% each.
- If the student does not reach the 6.5/10 score in the mid-term tests, and therefore does not liberate matter, the exam at the end of the quarter will be the 40% of the final mark.

2. Laboratory practices: attitude, reports and knowledge examination will be assessed at the end of the practices. They will be the 20% of the final mark.

Students will have the right to be assessed through the final assessment system regardless of whether or not they have participated in the continuous assessment system. To this end, the student must submit in writing to the lecturer responsible for the subject the waiver of the continuous assessment, for which he/she will have a period of 18 weeks from the beginning of the course according to the academic calendar of the center. The final assessment for the students who did not carry out the continuous assessment will consist of:

1.- Carry out a laboratory practice to evaluate the learning outcome of the subject related to the application of experimental techniques, or make the practices during the course, the reports and the exam (20%).
2.- Take the final written test consisting of a written exam of theory and problems (80%).

Students may submit their renouncement to the call by a letter to the lecturer who teaches the subject within a period to be at least one month before the date of completion of the teaching period of the corresponding subject.

NOTE: To pass the subject it is necessary to overcome both the laboratory practices and the written examination of theory and problems.

Passed quarters are saved until the extraordinary call.

The laboratory practices can be saved for the next academic year if the student has passed the practical part and not the theoretical part of the subject. The student who wants to save them would have to use a call.

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

It will consist of a written exam including theoretical issues (concepts, definitions, etc), and theoretical and practical questions related to the application of theoretical knowledge (80%), and a laboratory practice exam (20%).

Those students who do not take the exam will not consume a call.

**MANDATORY MATERIALS**

VIRTUAL PLATFORM: Egela.

**BIBLIOGRAPHY**

Basic bibliography


Detailed bibliography

- *Química Orgánica*. Mary Ann Fox. Editorial Pearson-Education
- *Fundamentos de Química Analítica*. Douglas A. Skoog. Editorial Thomson

Journals

Web sites of interest

- [http://www.lenntech.com/espanol/tabla-periodica.htm](http://www.lenntech.com/espanol/tabla-periodica.htm)

**OBSERVATIONS**

Con carácter general, y salvo que se indique lo contrario, durante el desarrollo de una prueba de evaluación en la UPV/EHU, quedará prohibida la utilización de libros, notas o apuntes, así como de aparatos o dispositivos telefónicos, electrónicos, informáticos, o de otro tipo, por parte del alumnado.
Acoustics is one of the subjects in the 4th year of the Degree of Technical Architecture.

Noise is one of the most common pollutants in the today society. It is well known that being exposed to high or persistent noises can lead to severe health and comfort problems, which negatively affect our life quality. In 2013, a new appeared at the media telling "A pianist faces 7.5 years of prison for disturbing one neighbour". The consciousness of the today society about building comfort and noise issues is rising more and more, which is also reflected on the increasing normative requisites to be fulfilled.

In Architectural Acoustics we try to provide you with the foundations that govern the phenomenon of noise, to analyse which are their effects as well as the methods to measure and evaluate them. Moreover, it develops a technical formation that will lead you to set-up and project spaces with an adequate sonority for their purpose, with acceptable noise levels that are isolated from noise sources. In this way we will create more comfortable and healthy spaces.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

Competences of the subject:

C1: Apply the basic concepts of Acoustics to the elaboration of building projects, in order that they fulfill the requirements of conditioning and isolation for their use.

C2: Prevent from the possible work risks derived from noise as well as the environmental risks due to acoustic pollution.

C3: Detect acoustic isolation and conditioning problems, do reports and analyses using the typical equipment for measuring acoustic variables.

C4: Plan conditioning and isolation interventions in order to improve the acoustic performance.

In this subject, you will work on three cross-competences, as well as those corresponding to the module and the degree.

COURSE CONTENTS, THEORETICAL & APPLIED

The contents are grouped in four major blocks:

1# Block. The physical characteristics of sound are studied, and how it is related to the perception by human hearing.

-1# Chapter. Introduction
-2# Chapter. Audition

2# Block. The basic aspects of sound propagation in open and closed spaces are described.

-3# Chapter. Sound propagation in open space
-4# Chapter. Acoustic conditioning

3# Block: Several questions related to noise are studied.

-5# Chapter. Noise

4# Block: The concept of sound isolation as well as the methods to reach it are described.
-6# Chapter. Sound isolation.

TEACHING METHODS
In order to acquire progressively the required concepts, the following tasks will be carried out:

TASKS: the professor will ask you for different tasks along the year, which could consist in:
- Solving numerical problems, individually or in group
- Developing of works and project, individually or in group
These tasks will be uploaded to the eGela platform of the subject. If a content is not adequate, it may be asked to be repeated. These tasks may comprise a revision of the concepts exposed in class, as well as the extension to new concepts; to solve them, you will have to work with books or webpages specialized on Acoustics, and they will have to show a profundity according to a student that will be soon a graduate.

LABORATORY PRACTICES: they are compulsory, and necessary to know about the experimental equipment as well as the usual measurement techniques and norms for the acoustic characterization of a room. The list of practices with their dates, along with a description of their content will be announced in eGela. The practices are done individually or in groups, and they are evaluated.

WRITTEN EXAM individually at the official date

ASSISTANCE TO CLASS: the minimum assistance will be 75% of the teaching hours. Should the student not fulfill this requirement, he/she would be out of the continuous evaluation.

TYPES OF TEACHING

<table>
<thead>
<tr>
<th>Types of teaching</th>
<th>M</th>
<th>S</th>
<th>GA</th>
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<tr>
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<tr>
<td>Hours of student work outside the classroom</td>
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</table>

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 40%
- Exercises, cases or problem sets 30%
- Laboratory practices 30%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT
There are two options to being evaluated: (1) follow the continuous evaluation or (2) choose a final exam. The student that rejects to be evaluated by continuous evaluation and wants to attend the final exam must let the professor know, in writing, two weeks before the end of the classes. He/she will have to fill the corresponding form available in eGela.

(1) CONTINUOUS EVALUATION:
- TASKS (30% of the final grade)
- LAB PRACTICES (30% of the final grade, minimum 5 out of 10): the assistance to the sessions as well as the submission of the corresponding reports are compulsory.
- WRITTEN EXAM individual (40% of the final grade, minimum 5 out of 10)
ASSISTANCE TO CLASS: the minimum assistance will be 75% of the teaching hours. Should the student not fulfill this requirement, he/she would be out of the continuous evaluation.

(2) FINAL EXAM:
The final exam will be held the same day and hour of the written exam of the continuous evaluation, but both exams will be different. It will consist in:
- 30% Lab practices (minimum 5 out of 10)
- 70% Individual written exam (minimum 5 out of 10)

OBSERVATIONS:

(1) Should the student not attend the final exam, his/her qualification will be 'Not presented'.

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

- 30% Lab practices (minimum 5 out of 10)
- 70% Individual written exam (minimum 5 out of 10)

The evaluation is performed by means of a final exam that comprises a practical part that will be held at the lab (whose weighting will be 30% of the total mark). All students that attend the practical part will work in group, in similar way to that employed along the year.

The students that have followed the continuous evaluation and want to retain the mark obtained in the different activities (tasks and lab practices) in order to have the same percent as in the previous opportunity, (60% continuous evaluation, 40% exam of all the contents) will have to apply to the professor by writing at least 10 days before the official date of the exam.

**MANDATORY MATERIALS**

- 

**BIBLIOGRAPHY**

**Basic bibliography**


**Detailed bibliography**

Journals

Web sites of interest

**OBSERVATIONS**
Acoustics is one of the subjects in the 4th year of the Degree of Technical Architecture.

Noise is one of the most common pollutants in the today society. It is well known that being exposed to high or persistent noises can lead to severe health and comfort problems, which negatively affect our life quality. In 2013, a new appeared at the media telling "A pianist faces 7.5 years of prison for disturbing one neighbour":. The consciousness of the today society about building comfort and noise issues is rising more and more, which is also reflected on the increasing normative requisites to be fulfilled.

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-6# Chapter. Sound isolation.


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**WRITTEN EXAM** individually at the official date

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**TYPES OF TEACHING**

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**Evaluation methods**

- End-of-course evaluation

**Evaluation tools and percentages of final mark**

- Written test, open questions 40%
- Exercises, cases or problem sets 30%
- Laboratory practices 30%

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

There are two options to being evaluated: (1) follow the continuous evaluation or (2) choose a final exam. The student that rejects to be evaluated by continuous evaluation and wants to attend the final exam must let the professor know, in writing, two weeks before the end of the classes. He/she will have to fill the corresponding form available in eGela.

(1) CONTINUOUS EVALUATION:

- TASKS (30% of the final grade)
- LAB PRACTICES (30% of the final grade, minimum 5 out of 10): the assistance to the sessions as well as the submission of the corresponding reports are compulsory.
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MANDATORY MATERIALS

BIBLIOGRAPHY

Basic bibliography

Detailed bibliography
&amp;#8226; Ruido industrial y urbano. Rejano de la Rosa, M. Editorial Paraninfo Thomson Learning
&amp;#8226; Diseño acústico de espacios arquitectónicos. A. Carrión Isbert, Alfaomega, eds. UPC (2003)
&amp;#8226; Acústica de los edificios, M. Meisser, Editores Técnicos Asociados (1973)

Todos los libros los podéis consultar en la primera planta de la biblioteca.

Journals
Especial Acústica de Investigación y Ciencia

Web sites of interest
http://www.ehu.es/acustica/
http://ocw.uc3m.es/ingenieria-termica-y-de-fluidos/acustica-tecnica
http://gcastro.webs.uvigo.es/PFC/PROYECTO_ZALO.htm

OBSERVATIONS

En el caso de que las condiciones sanitarias impidan la realización de una actividad docente y/o evaluación presencial, se activará una modalidad no presencial de la que los/las estudiantes serán informados puntualmente.
DESCRIPTION & CONTEXTUALISATION OF THE SUBJECT
This subject presents the basis of the design of mechanical elements: the safety degree is assessed according to the loads, dimensions and material of the mechanical element.

The subject consists of two differentiated parts: 'Statics' and 'Mechanics of Materials'. In Statics, the mechanical element is isolated and the external forces are analysed to obtain a free solid diagram. In Mechanics of Materials, the solid is considered deformable. This allows the study of internal forces (stresses) created by the external forces. Comparing the magnitude of these stresses with the mechanical properties of the material, it the safety coefficient is calculated and, thus, the design of the part is validated.

The subject offers an overview of the mechanical design of parts.

COMPETENCES/LEARNING OUTCOMES OF THE SUBJECT
Competences:
Learn about and use the principles of materials resistance.
Solve problems with initiative, decision-making, creativity, critical thinking and communication.
Develop the necessary learning skills to carry out ongoing training with a high level of autonomy.
Apply strategies found in scientific methodology.
Work efficiently in groups.

Learning outcomes:
Knows and uses the basic principles of particle statics and rigid solids.
Knows and uses beam and cable elements, the calculation of their main parameters for different types of loads.
Design structures in 2 and 3 dimensions.
Knows and uses the tensile and compression loads.
Knows and uses the bending loads in beams.
Knows and uses the torque loads in axes.
Knows and uses the buckling loads in columns

THEORETICAL/PRACTICAL CONTENT
Unit 1. Statics of the particle and the rigid solid.
Unit 2. Beams and cables.
Unit 3. Structures.
Unit 4. Stress and deformation
Unit 5. Axial loads: tensile and compression.
Unit 6. Torque.
Unit 7. Bending and buckling.

METHODOLOGY
In this subject different teaching methodologies are used, being the most common the problem-solving. The participation in the programmed activities ensures the development of the right skills by the students.
The following activities take place over the year:
- Lectures: the conceptual content of the subject is explained, with student participation in occasional debates.
- Seminars: cooperative work is done, using the puzzle of problems in groups.
- Practical work in the laboratory: the mechanical properties of a material are measured and the results shared among the groups so reach agreement on conclusions.

TYPES OF TEACHING

<table>
<thead>
<tr>
<th>TYPE OF TEACHING</th>
<th>M</th>
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<th>GA</th>
<th>GL</th>
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<td>CLASSROOM HOURS</td>
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<td>7</td>
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<td>HOURS OF STUDY OUTSIDE THE CLASSROOM</td>
<td>60</td>
<td>20</td>
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</table>

Legend: M: Lecture S: Seminario GA: Practical Class Work GL: Practical Lab work GO: Practical computer work
GCL: Clinical Practice TA: Workshop TI: Ind. workshop GCA: Field workshop
ASSESSMENT SYSTEMS
- Continuous assessment
- Final assessment

TOOLS USED & GRADING PERCENTAGES
- Extended written exam 70%
- Practical work (exercises, case studies & problems set) 10%
- Team work 20%

ORDINARY EXAM CALL: GUIDELINES & DECLINING TO SIT
Assessment in this subject is combined. The exam must be passed with a minimum mark of 5/10 to pass the subject. It is also necessary to complete satisfactorily the practical work to pass the subject. Aptitude and participation during the year also has an impact on the final grade.

A student who, for justified reasons, cannot participate in the combined assessment system (or, as the case may be, the continuous assessment system) may take a final exam in which the practical part will also be assessed. To do this, he/she will notify the professor responsible for the subject in writing within one month of the data set for the assessment of the subject. In this case, the student will be assessed in a single final exam, which will include the practical part and will account for 100% of the grade.

A student who wishes to withdraw from continuous assessment may do so in writing to the professor who teaches the subject, at least one month before the completion of the teaching period for the subject.

If the student does not present him/herself for the written exam, in any of the calls, she/she will be considered to have withdrawn from said call and will appear as "Not Presented".

EXTRAORDINARY EXAM CALL: GUIDELINES & DECLINING TO SIT
9th article.
In the extraordinary exam call, a single final exam is the only evaluation system. The final exam includes both, theoretical and practical parts, it accounts for 100% of the grade.
BIBLIOGRAPHY

Basic references:


In-depth bibliography:

Mechanics of Materiales, R.C. Hibbeler, Pearson, 2006
The Integrated Management Systems subject is one in the industrial branch of the 4-year Engineering Degree in Renewable Energies, taken in the 1st term of the 4th year.

The aim of the subject is to familiarise students with the structure of a management system and so that they can acquire the required knowledge to document the different processes involved, allocate responsibilities and formalise records that provide evidence of the functioning of the system to third parties.

**Theme 1 Introduction to management systems**

Introduction to the general functioning of different types of business management.

**Theme 2 Quality management**

Basic principles and models of Quality management.

**Theme 3 Environmental management**

Basic principles and models of Environmental management.

**Theme 4 Safety and Prevention of Workplace Hazards**

Basic principles and models of the management of Safety and Prevention of Workplace Hazards.

**Theme 5 Integration of management systems**

Analysis of the relationships between different types of management systems and their integration.

Minimum attendance: 95%

**Lectures**

Presence-based: Presentation, explanatory and/or demonstrative sessions by the professor.

Non-presence-based: reading of texts, autonomous study and preparation of theoretical tests, bibliography search and reading.

**Practical classroom work**

Presence-based: Project design.

Non-presence-based: Project design.

**EVALUATION:**

The subject is divided into 4 projects that the student carries out over the 15 weeks of the first term. The idea is that, through self-directed learning, they can apply concepts of quality and environmental management and the prevention of workplace hazards to a company they have created.

If the attendance and project criteria are met, 100% of the evaluation grade will be obtained through the projects. If not, there will be a final exam.
SUBJECT

27866 - Geothermal and Solar Thermal Energy

DESCRIPTION & CONTEXTUALISATION OF THE SUBJECT

The most usual thermal renewable energy sources are biomass, solar, and geothermal. The scope of this subject deals with the latter two (solar thermal and geothermal), and the role they play for low temperature thermal energy generation, both for space conditioning, and for hot water production. This subject is related to other subjects, such as Thermodynamics, and Heat Transfer (both at 2nd course), and Energy Efficiency at 4th course.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

The subject uses a practical focus in order to design, calculate and analyze the performance of solar thermal systems, and the appliances used to capture and use geothermal energy. Specifically, we will work these competences:

* To develop the essential knowledge of geothermal and solar thermal energy, together with the technologies used to take advantage of them
* To coherently use the procedural knowledge associated with scientific methodology, in order to solve the problems associated to these technologies, aiming to select the optimal typologies and working parameters
* To adopt an attitude propitious to energy saving, so as to value if the proposed system is efficient enough, or too polluting compared to other technologies, and to define improvements, in case they are needed

THEORETICAL/PRACTICAL CONTENT

A- Solar thermal energy
1. Introduction to solar energy
2. Solar radiation
3. Low and medium temperature solar systems
4. Solar collectors
5. Storage system
6. Solar thermal system design. Legislation
7. Solar heating. Passive solar systems

B- Geothermal energy
8. Introduction to geothermal energy
9. The earth. Internal structure and heat from the earth
10. Very low enthalpy geothermal energy uses
11. The heat pump
12. Geothermal heat exchanger. Sizing
13. Implementation

C- Solar and geothermal system combination

METHODS

Magistral classes will be based on the study of actual installations, analyzing the basic concepts of their performance, with a theoretical-practical focus.
Classroom practices will be used to design and size a solar thermal and a geothermal system, working in group with other classmates.
Laboratory practices will be used to deepen in the knowledge of these systems, using commonly used elements of solar and geothermal systems, and performing different tests with them.

TYPES OF TEACHING

<table>
<thead>
<tr>
<th>Type of teaching</th>
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<td>Hours of study outside the classroom</td>
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<td>26.5</td>
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Legend:

M: Lecture
S: Seminar
GA: Pract.Class.Work
GO: Pract.Lab work
GCL: Clinical Practice
TA: Workshop
TI: Ind. workshop
GCA: Field workshop

ASSESSMENT SYSTEMS

- Final assessment system

TOOLS USED & GRADING PERCENTAGES
- Extended written exam  40%
- Practical work (exercises, case studies & problems set)  10%
- Team work (problem solving, project design)  50%

**ORDINARY EXAM CALL: GUIDELINES & DECLINING TO SIT**
Written exam: during the course, there will be two theoretical-practical written exams, each of them about parts A and B of the exam. Passing each of these exams will mean that the corresponding part of the exam is passed. It will combine theoretical questions and practical exercises. It will be 40% of the final grade. In order to pass the subject, the students should attend both partial exams, or the final exam. In case the student does not attend the final exam, the grade published will be "Not Presented".
Laboratory practices: the students will have to write a report with the conclusions of the laboratory practices. It will be 10% of the final grade. This is mandatory.
Group work: Students will have to write a technical report of the design of a solar thermal installation, and a geothermal installation. It will be 0% of the final grade. This is mandatory.

**EXTRAORDINARY EXAM CALL: GUIDELINES & DECLINING TO SIT**
In the extraordinary call, the student will be graded following the same criteria. Additionally, the grade obtained in the written exam, the laboratory practices or the group work can be saved from the ordinary call, if any of these has been passed.
In case the student wants to improve the grading of the laboratory practices or the group work, the new reports should be sent to the teacher the day before the written exam.

**COMPULSORY MATERIALS**
There is no mandatory material. During the course, the teacher will upload to the moodle platform the materials used in the classroom, as well as supplementary material considered of interest.

**BIBLIOGRAPHY**

Basic bibliography

- In-depth bibliography
  - Manual de climatización geotérmica : desarrollo de todo el proceso de instalación de un sistema de geotermia de muy baja temperatura / Asociación Cluster de Xeotermia Galega

Journals
Renewable Energy
Renewable and Sustainable Energy Reviews

Useful websites
www.idae.es
www.asit-solar.com
www.googlenergy.com

**REMARKS**
SUBJECT

27875 - Eficiencia Energética

ECTS Credits: 6

DESCRIPTION & CONTEXTUALISATION OF THE SUBJECT

Energy saving and efficiency are key issues in an energy model based on renewable energy. At the same time, as fossil energy becomes more expensive, and renewable energy, with a lower energy density, become more important, energy saving will be more necessary. This subject deals with concepts related with energy consumption evaluation, and the options available to reduce that consumption and improve the efficiency of the processes.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

The subject uses a practical focus in order to explain energy efficiency measures in industry and building sectors. Specifically, we will work these competences:

* To develop the essential knowledge of energy efficiency, together with the technologies used to take advantage of it
* To coherently use the procedural knowledge associated with scientific methodology, in order to solve the problems associated to these technologies, aiming to select the optimal typologies and working parameters

THEORETICAL/PRACTICAL CONTENT

Part 0 - Introduction and legislation
- 0. Objectives
  1. Historical origin
  2. Energy efficiency
  3. Basic concepts
  4. Actual legislative context (national and international)
Part 1 - Industry
- 1. Combined heat and power
- 2. Heat recovery
- 3. Isolation improvement
Part 2 - Buildings
- 1. Building envelope
- 2. Thermal systems in buildings
Part 3 - Industry and building integration
- 1. District heating
- 2. Other practical examples

METHODS

Magistral classes will be based on the study of actual systems, analyzing the basic concepts of their performance, with a theoretical-practical focus.

Classroom practices will be used to work in groups with other classmates, based on real cases, to propose and evaluate energy efficiency measures.

Seminars will be used to share the advances of the working groups.

Computer practices will be used to learn different computer programs used to evaluate energy efficiency measures.

TYPES OF TEACHING

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<td>Classroom hours</td>
<td>30</td>
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<tr>
<td>Hours of study outside the classroom</td>
<td>40</td>
<td>10</td>
<td>30</td>
<td>10</td>
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</table>

Legend:
- M: Lecture
- S: Seminario
- GA: Pract.Class.Work
- GL: Pract.Lab work
- GO: Pract.computer wo
- GCL: Clinical Practice
- TA: Workshop
- TI: Ind. workshop
- GCA: Field workshop

ASSESSMENT SYSTEMS

- Final assessment system

TOOLS USED & GRADING PERCENTAGES

- Extended written exam 40%
- Team work (problem solving, project design) 60%

ORDINARY EXAM CALL: GUIDELINES & DECLINING TO SIT

Extended written exam: A final theoretical-practical exam will be done. The total percentage of this part in the final grade is 40%. The final exam needs to be passed in order to pass the subject.

Group work: Students will have to write two technical reports on energy efficiency in industry and in buildings. It will be
60% of the final grade. This is mandatory.

**FINAL GRADE: EXTENDED WRITTEN EXAM (40%) + GROUP WORK (60%)**

* In order to pass the subject, the extended written exam's grade should be of at least 35%. If this minimum grade is not obtained, the grade appearing in the subject record will be that of the written exam.

**NOTE:** Those students that, with a justified cause (Art. 43 Normativa de Gestión para la Enseñanzas de Grado. UPV/EHU), can not take part in the mixed evaluation system, may attend a final exam that also covers the practical part of the subject. In such a case, the student needs to inform the teacher, with at least one month in advance of the final exam date.

Article 39 of the same normative sets that the student can give up the evaluation call, with at least one month in advance of the end of the teaching period of the subject.

If the student does not attend the written exam, in any of the calls, it will be equivalent to renouncing the subject in that call, and the subject record will appear as "Not Presented".

### EXTRAORDINARY EXAM CALL: GUIDELINES & DECLINING TO SIT

In the extraordinary call, the student will be graded following the same criteria. In the case of the mixed evaluation (by default), the student can save the grade of the written exam or the group work, in the next cases:

* The grade of the written exam is higher than 3.5/10
* The group work is passed (higher than 5.0/10)

In case the student wants to improve the grading of the group work, the new reports should be sent to the teacher the day before the written exam.

### COMPULSORY MATERIALS

There is no compulsory material. During the course, the teacher will upload to the moodle platform the materials used in the classroom, as well as supplementary material considered of interest.

### BIBLIOGRAPHY

**Basic bibliography**

**In-depth bibliography**

* Energy Efficiency in Industry (Eur) de J.SIRCHIS y J. Sirchis.

**Journals**

* Applied Energy (Elsevier)
* Energy and Buildings (Elsevier)
* Energy Conversion and Management (Elsevier)

**Useful websites**

* www.idae.es
* http://apps1.eere.energy.gov/buildings/energyplus

### REMARKS
The subject of CALCULATION is a subject of the first term of the first course and has 6 ECTS credits. The Presential classes are divided into three types: master classes (30 hours), classroom practices (23 hours) and seminars (7 hours). In addition to the classes, students will have to work 45 hours of lectures, 34.5 hours of classroom practice and 10.5 hours of seminars.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

Basic skills:
CB1-Possess and understand knowledge of mathematics from the base of general secondary education
CB2- Apply terminology and mathematical knowledge in the workplace in a professional way.

Specific competence:
FB01-Solve mathematical problems that may arise in engineering Apply knowledge of calculus.

Transversal competence
G007-Working in a multilingual and multidisciplinary environment
G011-Developing learning skills necessary for continuing education and to undertake further studies, with a high degree of autonomy, skills based on respect for human rights and equal opportunities for all people.

Learning outcomes of the subject:
- Analyze and express ideas correctly using mathematical terminology.
- Knows how to operate with complex numbers in their different forms.
- Carries out the complete study of a real function of a real variable.
- Calculates the primitive of a function and knows how to apply it in technological subjects.
- Knows the concept of partial derivative and calculates the directional derivative in a point.
- Knows the concept of double and triple integral and knows how to apply it to different areas.

COURSE CONTENTS, THEORETICAL & APPLIED

Item 1. The complex number.
Definition and graphic representation. Trigonometric, exponential and polar form. Operations with complex numbers and decomposition of polynomials into factors.

Item 2. Real functions of real variable.
Limit and continuity. Applications.

Item 3. Derivability of real functions from real variables.

Item 4. Functions of several variables.

Item 5. Derivability of functions of several real variables.

Indefinite integral. Change of variable, integrals by parts, rationals, trigonometrics and irrationals.

Item 7. Defined integral.
Riemann's integral. Barrow's rule. Applications.

Item 8. Multiple integrals.
Iterated integrals. Double and triple integrals. Applications.

TEACHING METHODS
The course will follow a methodology characterized by the following aspects:
Preliminary work: the students will carry out the tasks indicated by the teacher, in a non-presential way.

In class: the teacher will propose various training activities. Among others, they will solve the doubts that have arising from previous work done.

Deliverables and tests: students will deliver the deliverables and perform the tests that the teacher indicates and will be provided with the corresponding feedback.

As for the evaluation, the tools and percentages of qualification are the following:
Deliverables and tests: 30%
Final exam: 70%

Note: it is necessary to obtain at least a 4/10 in each of the two parts indicated in order to pass the course.

**TYPES OF TEACHING**

<table>
<thead>
<tr>
<th>Types of teaching</th>
<th>M</th>
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<tbody>
<tr>
<td>Hours of face-to-face teaching</td>
<td>30</td>
<td>7</td>
<td>23</td>
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<tr>
<td>Hours of student work outside the classroom</td>
<td>45</td>
<td>10.5</td>
<td>34.5</td>
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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 30%

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

Article 8.
In any case, the students will have the right to be evaluated by means of the final evaluation system, independently whether or not it has participated in the continuous or mixed evaluation system. To do so, students must submit the teachers in charge of the course will be asked to waive the continuous or mixed assessment, and will have of a period of 9 weeks, starting from the beginning of the term, in accordance with the academic calendar of the center. In this case, the student will be evaluated with only one final exam, which will include a theoretical and practical part, and which will comprise 100% of the grade.

Article 12. Waiver of the call
12.2.- In the case of continuous evaluation, if the weight of the final test is greater than 40% of the grade of the If you do not take the final exam, the final grade for the course will be no submitted or not submitted. Otherwise, if the weight of the final test is equal to or less than 40% of the grade of the subject, students may waive the call within a period of at least one month before the date of the end of the teaching period of the corresponding subject. This resignation must be submitted by written to the teachers responsible for the subject.

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

Article 9
The evaluation of the subjects in the extraordinary calls will be carried out exclusively through the system of final evaluation.

The final evaluation test of the extraordinary call will consist of as many tests and assessment are necessary to be able to evaluate and measure the defined learning outcomes, in a way that is comparable to as they were evaluated in the ordinary call. Positive results obtained by the students during the course.

**MANDATORY MATERIALS**

Workbook

Neither a calculator nor any electronic device may be used in the examinations and/or face-to-face tests.
BIBLIOGRAPHY

Basic bibliography

Detailed bibliography

PROBLEMAS:

Journals

LA GACETA DE LA REAL SOCIEDAD MATEMÁTICA ESPAÑOLA

Web sites of interest

http://www.divulgamat.net
http://www.hiru.com
http://es.wikipedia.org/wiki/Cálculo_infinitesimal
http://www.vitutor.com/
https://www.geogebra.org/
https://es.mathworks.com/
https://www.khanacademy.org/

OBSERVATIONS

A teaching guide is proposed for the next course: whether the teaching modality is virtual or face-to-face. In the case of the face-to-face modality, the training activities (classes, tutorials and evaluation) will be carried out face-to-face. In the case of the virtual modality, the training activities (classes, tutorials and evaluation) will be carried out online using eGela's tools.
The subject of Business Organisation, Management and Administration is part of the basic training module of the degree course in Renewable Energies Engineering. It is a subject of 6 ECTS in the 2nd term of the first year, 45 hours of lectures and 15 hours of practical work.

The subject aims to study and provide a response to the economic problems posed in companies. The objective of the subject is to gain in-depth knowledge of modern-day organization and administration of companies, with a wide-ranging and updated vision of the complex world of business.

**Theme 0: Introduction to business. General concepts**

**Theme 1: Company Fundamentals**

Learn about different types of companies and the notion of 'company'

**Theme 2: Marketing**

Strategic marketing Operational marketing. Exercises: allocation of prices based on cost

**Theme 3: Finance I**

Sources of financing. Balance sheet, operating account. Financial equilibrium. Investments. Profitability

**Theme 4: Teamwork**

Phases for obtaining results. Necessary functions. Leadership

**Theme 5: Strategy and Production**

Evolution of a strategy. External analysis: Porter's 5 forces Internal analysis: Value chain General strategies Specific strategies

**EVALUATION:**

**Oral presentations (30%).**

Reading about cases, discussion and sharing.

Problem-solving.

During the practical work, the student will produce three team projects

**Project 1:** To be handed in during the 21st week of classes. The team will make an oral presentation of an economic topic it considers to be of interest. A report will not be written, the presentation will be made in PowerPoint or a similar program.

**Project 2:** To be handed in during 26th week of classes. The team will create a company and develop the points required for the task. Points seen in class in themes 0-1-2. A report will not be written, the presentation will be made done in PowerPoint or a similar program.

**Project 3.** To be handed in during week 30 of classes. The students will apply what they have learned in theme 5 to the company created in project 2. Instead of studying the theme and having it tested in the exam, the idea is that the students should do it in an applied way in the company created, and apply self-directed learning.
Minimum attendance required 100% (practical sessions).

Exam (70%):

It will be a theoretical-practical written exam. They will have to develop theoretical questions and solve practical problems related to the subject.
SUBJECT
27877 - Thermoelectric Solar Power

DESCRIPTION & CONTEXTUALISATION OF THE SUBJECT
Amongst the technologies for the exploitation of renewable energies, Solar Thermoelectric Energy or Concentrating Solar Power (CSP) plants have gained more and more importance during the last decade. This subject covers the design and tecno-economic analysis of these plants. With that aim, the following tecnologies are analysed: parabolic-trough, central tower receiver and Stirling dish.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT
The subject covers from a practical point of view, the analysis of the electric power generation by solar thermal means.

THEORETICAL/PRACTICAL CONTENT
Chapter 1 Introduction to Concentrating Solar Power plants
Chapter 2 Fundamentals of thermodynamic power cicles applied to Concentrating Solar Power plants
Chapter 3 Fundamentals of thermal radiation applied to Concentrating Solar Power plants
Chapter 4 Parabolic-Trough Concentrating Solar Power plants
Chapter 5 Thermal Energy Storage and hibdirization
Chapter 6 Central Receiver Concentrating Solar Power plants
Chapter 7 Stirling Dish Concentrating Solar Power plants

METHODS
M (Master class): Master classes will be based on the presentation of the theoretical concepts needed for the design and tecno-economic analysis of CSP plants

S (Seminar): Seminars will cover specific issues relevant to CSP plants, i.e., renewable energy markets and sustainability of CSP plants.

GA (Class practice): Class practices will cover practical exercises dealing with relevant issues regarding CSP plants, as well as the execution the team projects.

GO (Computer Practice): Computer practices will cover the use of the System Advisor Model (SAM) software for the techno-economic evaluation of CSP plants.

TYPES OF TEACHING

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Legend:
GCL: Clinical Practice  TA: Workshop  TI: Ind. workshop  GCA: Field workshop

ASSESSMENT SYSTEMS
- Final assessment system

TOOLS USED & GRADING PERCENTAGES
- Extended written exam  40%
- Team work (problem solving, project design)  60%

ORDINARY EXAM CALL: GUIDELINES & DECLINING TO SIT
Written exam: A final theoretica exercise will be made. The total percentage of this examen in the final mark will be of 40%. To pass the subject, the mark of this exam should be at least of 3.5. It this mark is not reached, the mark of the team works wont be added to the obtained mark.

Team works: Throughout the course, in the class and computer practices, the students will execute the team works on the design of a parabolic-trough CSP plant. The teams will be of 2-4 students each. The total percentage of this work in the final mark will be of 60%.
FINAL MARK: WRITTEN EXAM (40%) + TEAM WORK (60%)

EXTRAORDINARY EXAM CALL: GUIDELINES & DECLINING TO SIT

In the extraordinary call, the student will be evaluated following the same criteria than in the ordinary. Additionally, he/she will save the mark from the written exam or the team work if in the ordinary call:

- A minimum of 3.5 is get in the written exam.
- The team work is passed.

COMPULSORY MATERIALS

There is not material for mandatory use. Throughout the course, the teacher will upload to the eGela platform all the required material, including presentations as well as the rest of material that could be required by the subject.

BIBLIOGRAPHY

Basic bibliography


In-depth bibliography


Journals

Useful websites

* Solar Concentra: http://www.solarconcentra.org/

* System Advisory Model (SAM): https://sam.nrel.gov/

* Power from the Sun: http://www.powerfromthesun.net/

REMARKS
27862 – HEAT TRANSFER

TEACHING GUIDE 2018/19

Centre 264 - Faculty of Engineering - Gipuzkoa. Elbar Department
Cycle Indifferent
Plan GRENOV20 - Bachelor’s Degree In Renewable Energy Engineering
Year Second year
ECTS Credits: 6

DESCRIPTION & CONTEXTUALISATION OF THE SUBJECT

In the practice of engineering, obtaining a basic understanding of the mechanisms of heat transfer is increasingly important. It plays a critical role in the design of renewable energy systems.

The subject develops fundamental knowledge of the heat and mass transfer. This is a basic science that studies the ratio of thermal energy transfer.

For this subject, students need to obtain a solid base in calculus (1st year calculus and extension of mathematics in 2nd year) and physics (physics and physical expansion of 1º year). Equally, it is advantageous to have passed thermodynamics, fluid mechanics and differential equations (all 2nd year), although the concepts associated with these themes are presented and reviewed as needed.

ORDINARY EXAM CALL: GUIDELINES & DECLINING TO SIT

1 - WRITTEN EXAM*:

1st exercise: heat transfer
2nd exercise: heat transfer
3rd exercise: heat transfer

Written exam grade = [(1st exercise)x(2nd exercise)x(3rd exercise)]^1/3.

Also, three written tests will be taken during the year using the Socrative tool in each test, all the class must participate and 80% of the answers must be correct in order to get 5% of the final grade, otherwise no grade will be awarded.

2 - COMPUTER PROBLEMS**: 7 computer problem classes (1.5 hours’ duration each) will be taken using EES software. In the last three computer classes theoretical problems presented in lectures will be solved. In these 3 computer classes the pattern will be the same: in the first hour the teacher will lead the exercises and in the last half hour the student will be evaluated. The exam result will be Pass or Fail. The student will be given one problem, similar to those presented during the first hour, and if he/she finds the correct solution he/she will get 5% of the final grade, otherwise nothing. Since there are 3 evaluated computer classes, their total weight is 15% of the final grade.

Note: Students that have a formal reason (according to the article 43 of the Management Regulation for Degree Course Teaching. UPV/EHU) may not participate in the joint evaluation system will have access to a final exam which will be also evaluated the practical part. For this purpose, the student shall express his/her wish, in writing and justified to the teacher in charge of the subject, within a period of at least one month before the date set for the evaluation of the subject. In this case, the student will be evaluated in a single final exam, which will include a practical part, and shall cover 100% of the mark.

Article 39 of the same regulation states that the student that wishes to withdraw may submit his/her withdrawal from the call for evaluation through a letter sent to the professor who taught the year within a minimum period of one month prior to the date of completion of the teaching period of the year. In the event that the student has to take the
written test written in any of the calls, this will mean the withdrawal from such call for evaluation and the student will be considered as not presented.

EXTRAORDINARY EXAM CALL: GUIDELINES & DECLINING TO SIT

The extraordinary call is governed by the same criteria as the ordinary call.
COURSE GUIDE 2020/21

Faculty 264 - Faculty of Engineering - Gipuzkoa. Eibar Department  Cycle Not Applicable
Degree GREN020 - Bachelor's Degree In Renewable Energy Engineering  Year Second year

COURSE

27861 - Statistical Mathematics  Credits, ECTS: 6

COURSE DESCRIPTION

The subject of STATISTICAL MATHEMATICS is a subject of the second semester of the second year and it has 6 ECTS. Classroom lessons are divided into three types: lectures (30 hours), classroom practices (15 hours) and computer practices (15 hours). In addition to the lessons, students will have to work 45 hours of lectures, 22.5 hours of classroom practice and 22.5 hours of computer practice.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

Basic skills:
CB1-Possess and understand knowledge of mathematics from the base of general secondary education.
CB2- Apply terminology and mathematical knowledge in the workplace in a professional way.

Specific competence:
FB01-Solve mathematical problems that may arise in engineering Apply knowledge of statistics.

Transversal competences:
G007-Working in a multilingual and multidisciplinary environment.
G011-Develop learning skills necessary to carry out continuous training, as well as to undertake, further studies, with a high degree of autonomy, skills based on respect for human rights and equal opportunities for all people.

Learning outcomes of the subject:
- Analyze and express ideas correctly using mathematical terminology.
- Statistically describe a sample by means of tables, graphs and measurements.
- Knows the concepts and applications of probability.
- Analyzes situations and models engineering problems of stochastic nature by means of variables randomly.
- Correctly applies sampling and parameter estimation techniques.
- Applies basic regression models to engineering problems.

COURSE CONTENTS, THEORETICAL & APPLIED

Unit 1 : Descriptive statistics.

Unit 2 : Combinatorial. Basic ideas of probability.

Unit 3 : Discrete random variables.

Unit 4 : Continuous random variables.

Unit 5 : Sampling and estimation theory.

Unit 6 : Hypothesis contrast.
Unit 7: Analysis of variance.
Analysis of variance with one factor of variation and with two independent factors of variation Tables ANOVA and ANOVA II.

Unit 8: Regression and correlation.

**TEACHING METHODS**
- Final exam: 75%.
- Computer training: 25%
A minimum score of 4 marks is required for both the computer training and the final exam.

**TYPES OF TEACHING**

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<tbody>
<tr>
<td>Hours of face-to-face teaching</td>
<td>30</td>
<td>15</td>
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<tr>
<td>Hours of student work outside the classroom</td>
<td>45</td>
<td>22,5</td>
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</table>

Legend:

**Evaluation methods**
- Continuous evaluation
- End-of-course evaluation

**Evaluation tools and percentages of final mark**
- Written test, open questions 75%
- Exercises, cases or problem sets 25%

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

In continuous evaluation the practices will be carried out throughout the four-month period and the written test on the day of the exam.

In the final evaluation the practices and the written test will be done on the day of the exam.

If classroom teaching should be replaced by virtual teaching, and above all, if it is not possible to take the exam in person, the assessment systems will be adapted to the situation. The tests taken so far (if any) will be kept. From then on, all the contents to be assessed will be evaluated by means of different tests and/or written and/or oral activities (papers, tests, exams, interviews...). As far as possible, the selected evaluation system will be maintained but continuous evaluation against the final will be encouraged.

**Article 8.**
In any case, students will have the right to be evaluated through the final assessment system, regardless of whether or not they have participated in the continuous or mixed assessment system. To do so, students must present a written waiver of continuous or mixed assessment to the teaching staff in charge of the subject, for which they will have a period of 9 weeks, counting from the beginning of the four-month period, in accordance with the school's academic calendar. In this case, the student will be evaluated with a single final exam, which will include a theoretical and practical part, and which will comprise 100% of the mark.

Article 12. Waiver of the call
12.2.- In the case of continuous evaluation, if the weight of the final test is higher than 40% of the grade of the course, it will be enough not to take the final test for the final grade of the course to be not submitted or presented. Otherwise, if the weight of the final test is equal to or less than 40% of the qualification of the subject, the students may waive the call within a period of at least one month before the end of the teaching period of the corresponding subject. This resignation must be presented in writing to the teaching staff responsible for the subject.

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

**Article 9**
The evaluation of the subjects in the extraordinary calls will be carried out exclusively through the final evaluation system.

The final assessment test of the extraordinary call will consist of as many tests and assessment activities as necessary to
be able to assess and measure the defined learning outcomes, in a way that is comparable to how they were assessed in the ordinary call. The positive results obtained in each part by the students during the course may be kept.

**MANDATORY MATERIALS**

Exercises notebook.

In the written test, a calculator and statistical tables may be used.

**BIBLIOGRAPHY**

**Basic bibliography**


**Detailed bibliography**

GEORGE C. CANAVOS. Probabilidad y estadística. Aplicaciones y métodos. MacGraw -Hill

JOSE M. CASAS SANCHEZ. Inferencia estadística para economía y administración de empresas. Ed. Centro de estudios Ramón Areces, S.A.

SIXTO RIOS. Análisis estadístico aplicado. Paraninfo.

KARMELE FERNANDEZ ETA BESTEAK. Estatistika-ariketak. Udako Euskal Unibertsitatea.

**Journals**

LA GACETA DE LA REAL SOCIEDAD MATEMATICA ESPAÑOLA

**Web sites of interest**

http://www.divulgamat.net
http://www.hiru.com
http://aulafacil.com/CursoEstadistica/CursoEstadistica.htm

**OBSERVATIONS**