

Academic Year/course: 2022/23

30155 - Structures Calculus

Syllabus Information

Academic Year: 2022/23

Subject: 30155 - Structures Calculus

Faculty / School: 179 - Centro Universitario de la Defensa - Zaragoza

Degree: 563 - Bachelor's Degree in Industrial Organisational Engineering

ECTS: 6.0

Year: 4

Semester: First semester

Subject Type: Optional

Module:

1. General information

1.1. Aims of the course

The subject and its expected results respond to the following approaches and objectives:

After completing the subject Structures calculation the student must be able to establish the sizing situations for a structure to be executed, determine the actions that will request it in each situation and calculate the effects that these actions will produce. You must know how to obtain, in accordance with the Technical Building Code, the effect to be borne in the most unfavorable situation. For this, he must be able to solve structures by methods based on rigidity and flexibility, manually and through computer programs.

These objectives are aligned with the following Sustainable Development Goals (SDG) of the United Nations 2030 agenda (<https://www.un.org/sustainabledevelopment/es/>), in such a way that the acquisition of the results of Learning of the subject provides the ability and competence to contribute to some extent to its achievement.

- Goal 9: Industry, innovation and infrastructure. It promotes the achievement of:

9.1 "To develop reliable, sustainable, resilient and high quality infrastructure,..." will provide structural design parameters that allow structures to be built with the minimum amount of material possible through design efficiency. If we combine this factor with the use of non-polluting, recycled and recyclable materials mentioned in goal 7.3, the learner will be able to calculate and execute structures that are not only reliable, resilient and of high quality, but also sustainable.

9.4 "By 2030, modernize infrastructure and retrofit industries to be sustainable, using resources more efficiently and promoting and promoting the adoption of clean and environmentally sound technologies and industrial processes, and making environmentally sound industrial processes and technologies, with all countries taking action in accordance with their respective capabilities." Its fulfillment is reinforced by the closely related target 7.3.

1.2. Context and importance of this course in the degree

The subject is part of the specific elective module Structures and Materials of the IOI Defense Profile. It is part of the training received by the student of the Fundamental Engineers Specialty, of the General Corps of the Army. It is a natural continuation of the subject Resistance of materials and is the basis for the calculation of the starting data of the other two theoretical subjects of the module.

This subject contributes to the training of Army Officers, providing knowledge about structures that will allow them to find and evaluate solutions to real problems.

1.3. Recommendations to take this course

To be able to approach the study of the subject must have previous knowledge of materials science (properties and behavior), mechanics (static, calculation of reactions), resistance of materials (Efforts, relationship between stresses and deformations). It is also necessary a certain domain of differential and integral calculus, resolution of systems of equations and ease of matrix management.

It is essential to attend classes, the daily study and the realization of the exercises proposed.

At the beginning of the subject the student should have passed most of the degree until the third year, so it is assumed that he / she will be able to successfully complete it.

2. Learning goals

2.1. Competences

C02 - Ability to plan, budget, organise, manage and monitor tasks, people and resources.

C04 - Ability to solve problems and take decisions with initiative, creativity and critical reasoning.

C06 – Ability to communicate knowledge and skills in Spanish.

C09 – Ability to work in a multidisciplinary group and in a multilingual setting.

C11 – Ability to continue learning and develop self-learning strategies.

C60 –Gaining the necessary competence to calculate elementary architectural constructions.

2.2. Learning goals

The student, to pass this subject, must demonstrate the following results ...

-To correctly apply the theoretical structural models to the analysis of real problems.

-Use with rigor and agility the different models and methodologies of structural analysis to apply them to their future professional practice.

2.3. Importance of learning goals

The learning results of this subject provide a deep knowledge of the behavior of the structures, present as a resistant element sustaining any type of machine, building, installation, etc. These learning outcomes are part of the skills that the student must acquire as part of the training of their fundamental specialty.

3. Assessment (1st and 2nd call)

3.1. Assessment tasks (description of tasks, marking system and assessment criteria)

FIRST CALL

Continuous assessment:

The student will be able to pass the total of the subject by the continuous assessment procedure. To do so, he/she must demonstrate that he/she has achieved the expected learning results by passing the evaluation instruments indicated below, which will be carried out throughout the four-month period:

1. Partial exams. One for each topic covered in the course. One or several problems and theoretical questions will be posed. The average grade of the partial exams will have a value in the final grade of 60%.
2. Computer practicals. They will consist of the resolution of a hyperstatic structure of bars by the direct method of stiffness, with the help of a spreadsheet. Depending on the number of students enrolled, it will be done individually or in teams. Its value in the final grade is 25%.
3. Work and oral expositions. It will consist of the study of some of the topics that are related to the subject but that are not covered in class. The results of the study will be presented publicly in class. Its value in the final grade is 15%.

In order to pass the continuous assessment it will be necessary to obtain in each of the three parts at least 4 points, and to have carried out all the tests, practices and presentations of which it consists on. In addition, a minimum grade of 3.5 points will be required in each partial exam. The student who obtains in the continuous assessment a qualification equal or higher than 5 will have passed the course and will not be obliged to attend the official exams.

Global test:

Students who do not pass the subject by continuous assessment or who want to improve their grade, will have the right to take the global test set in the academic calendar, prevailing, in any case, the best of the grades obtained. This global test will

be equivalent to the continuous evaluation tests described above and will have a weight of 100% in the final grade. It will consist of the resolution of theoretical questions and exercises of all the topics covered in the course. In order to pass the course, the student must obtain a final grade higher or equal to 5.

SECOND CALL

Global test:

Students who do not pass the subject in the first call may sit for a global test fixed in the academic calendar for the second call. This global test has the same structure as the one described for the global test of the first call. It will have a weight of 100%. In order to pass the course, the student must obtain a final grade higher or equal to 5.

EVALUATION CRITERIA

Both the exams of the continuous evaluation and those of the official exams (global tests) may contain theoretical and practical questions with open or multiple-choice answers and one or more problems. Errors in the multiple-choice questions will deduct one correct answer for every $n-1$ errors, where n is the number of answer options. A problem will be considered to be solved in an acceptable way if the correct result is reached, and then the procedure followed will be corrected and graded. If the student does not reach the correct result, the problem will be evaluated with zero points, although depending on the type of error made, the teacher may, at the discretion of the teacher, score that which is correct. Those errors related to units of measurement not commented by the student will be considered serious errors and will be scored with zero points in a problem. Likewise, problems in which the results obtained are absurd because they are excessively large or small, and which have not been detected by the student himself, will be graded with zero points. The above will be considered to have occurred if the result obtained and the correct result differ by an order of magnitude. These measures are intended to improve student learning by stimulating their ability to analyze results and their sense of proportion.

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The approach, methodology and assessment of this course is prepared to be equivalent in any teaching scenario. It will be adjusted to the socio-sanitary conditions of each moment, as well as to the indications given by the competent authorities.

The course is planned to facilitate continuous and active student learning. Learning resources to be used to achieve it are:

- Lectures are given by the teacher to the whole group. In these, theoretical concepts of the subject will be illustrated with examples to help understand and in which students are challenged to participate, reasoning about theoretical concepts exposed.
- Practice sessions. The contents of the theory sessions are strengthened by performing carefully selected problems to cover all relevant aspects. They are organized so that students become familiar with spreadsheet programs. Individual realization of problems, jobs and public exhibitions independently.
- Tutorials In which the student will be helped to solve doubts raised during learning.
- Other Learning activities scheduled.

4.2. Learning tasks

The course includes the following learning tasks:

- Classes about computer software.
- Practice sessions.
- Group work sessions.
- Tutorials.
- Conferences given by invited staff.
- Visits to a field work.

4.3. Syllabus

The course will address the following tasks:

- Introduction to the theory of structures. Stability and hyperstaticity.
- Basic theorems and applications.
- Technical Building Code (CTE), Basic Structural Safety Document (DB-SE).
- Technical Building Code (CTE), Basic Structural Safety Document Actions in the building (DB-SE_AE).
- Isostatic structures. Articulated structures.
- Statically indeterminate structures.

- Matrix calculation of bar structures.

4.4. Course planning and calendar

The available class sessions will be distributed in theoretical sessions, taught by the teacher, computer practices and public presentations by students about topics related to contents of the subject. To help achieve the necessary skills in English, these presentations will be held in English.

The assessment of the subject will be based on several examinations, practical exam and public presentations.

In addition, students who don't pass such evaluation, two final exams will be held in examination examinations.

If possible, a visit to fieldwork will be made. This activity is common to the three subjects of the module. Lectures given by invited staff can be scheduled too.

Key dates will be announced by the teacher, both in class and through the platform moodle support.

4.5. Bibliography and recommended resources

<http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=30155>