Universidad Zaragoza

Year : 2020/21

28606 - Physics II: static structure

Syllabus Information

Academic Year: 2020/21
Subject: 28606 - Physics II: static structure
Faculty / School: 175 - Escuela Universitaria Politécnica de La Almunia
Degree: 422 - Bachelor's Degree in Building Engineering
ECTS: 6.0
Year: 1
Semester: Second semester
Subject Type: Basic Education
Module: ---

1.General information

1.1.Aims of the course

The foreseen outcomes of this subject are based on the following approaches and goals:

- Comprehension of the concepts and fundamental laws that rule the structural analysis: Statics, recognizing and understanding their right use in different problems found in the Architecture and Engineering.
- Analysis of problems that make up the different aspects of the structural analysis: Statics, recognizing the multiple physics foundations underlying technical implementations, devices and real systems.
- Comprehension of the units of measurements and order of magnitude of the physical magnitudes in use, implementing them in problem solving related to aspects of Architecture and Engineering using the right numerical values with the right units of measurements.
- Correct use of the basic mathematical methods and reasoning for experimental measurements and simulations processing, expressing and interpreting the gathered data and relating them to their appropriate magnitudes and underlying physical laws.
- Correct use of the bibliography available with a critical mind and focus, using a technical language with clear ideas and concepts in order to explain and debate about issues of the underlying statics and knowledges related to it.
- Correct implementation and use of the multiple equations provided by the physics under study to fields such as the the Architecture and engineering.
- Comprehension of the meaning, right use and relationship among the multiple physical magnitudes in use.
- Capability to understand and describe the different type of structures based on the various supports and connections used for two and three dimensional structures, stability conditions, equilibrium and elements among others.

1.2.Context and importance of this course in the degree

This subject forms part of the block of subjects classified as "scientific fundaments". For a Building Engineer is of essential interest because of several reasons.

Firstly because of its technical content. It complements and extends several principles of mechanics, basic in Building Engineering, introduced in "Physics I: General Mechanics".

On the other hand, and more generally, this subject also prepares the student to face problems using different approaches that imply logics, optimization and a scientific approach.

Those students enrolled in this subject are going to be very well prepared to face and overcome with success and academic progress the subjects of structural analysis and strength of materials, given in the following years of this academic degree, and also to implement it to different areas in the Building Engineering and their professional development.

1.3.Recommendations to take this course

The study of physics implies several goals and difficulties that can only be achieved through work and progress based on previous knowledge. Because of this, students must begin this subject with several knowledges given in the first semester of the first course of this academic degree.

In order to succeed in this subject, it is advisable for the students to have passed with success the subjects given in the first semester and first course of this academic degree: "Physics I: General Mechanics" and "Mathematics applied to Edification".

2.Learning goals

2.1.Competences

After succeeding in this matter through the previously indicated goals. Students will acquire several competences. Such competences can be found in:

https://academico.unizar.es/sites/academico.unizar.es/files/archivos/ofiplan/memorias/grado/ingenieria/mv_142.pdf.

There can be found several competences common to the degree and several competences particular of this subject. All competences have an identification code. Below I present all the competences of this subject with their respective identification code.

General competences:

G01 - Capacity to organize and plan.

G02 - Capacity to solve problems.

G03 - Capcity to make decisions.

G04 - Aptitude for oral and written communication in the native language.

G05 - Capacity for analysis and synthesis.

G06 - Information management capacity.

G07 - Capacity to work in a team.

G08 - Capacity for critical reasoning.

G09 - Capacity to work in an interdisciplinary team.

G10 - Capacity to work in an international context.

G11 - Capacity of improvisation and adaptation in order to face new situations.

G12 - Leadership aptitude.

G13 - Positive attitude towards social and technological innovations.

G14 - Capacity for reasoning, discussion and presentation of own ideas.

G15 - Capacity of communication through words and images.

G16 - Capacity to search, analyze and choose information.

G17 - Capacity of autonomous learning.

G18 - Possess and understand knowledges in an area of study based in secondary education, that are usually found at a level that, although that it is supported by advanced textbooks, also includes some aspects that involve knowledge of the state of the art of their field of study..

G19 - Apply their knowledge to their work or vocation in a professional way and possession of the competences that are usually proved through the development and defense of arguments and problem solving within their area of study. .

G20 - Ability to collect and analyze relevant data (usually within their area of study) in order to make judgments that include a discussion on relevant social, scientific or ethical issues.

G21 - Transmit information, ideas, problems and solutions both to a specialized audience and to a non-specialized audience.

G22 - Develop those learning skills necessary to undertake further studies with a high degree of autonomy.

Specific competences:

CB2 - Applied knowledge of the principles of general mechanics, statics of structural systems, mass geometry, principles and methods of analysis of the elastic behavior of the rigid body.

The development of the previous competences through the achievement of the goals already presented will be evaluated through the so-called learning goals.

2.2.Learning goals

In order to pass this subject, the student must prove the following learning goals:

- Mastery and understanding of the fundamental concepts of structural statics applied to structures and beams theory.
- Capability for analyzing, hypothesis approach and apply of concepts in order to solve problems related to the theory of structures and beams.
- Capability for calculating the strains, reactions and forces applied to particles and rigid bodies in equilibrium.
- Make decisions, taking into account the different technical issues involved.
- Capability for resolve structures by the methods of knots and sections.
- Capability of calculus in solving problems that involve reactions and stresses in beams and cables.
- Understanding and calculation capacity of the different types of magnitudes involved in elasticity and structure problems.

2.3.Importance of learning goals

Arguably, the learning goals are "a statement of what the student is expected to know, understand and be able to do at the end of a learning period".

In this particular case, after passing this matter, through the learning goals, the student will acquire technical and scientific knowledge of structural statics that can be applied to other disciplines in Building Engineering, in daily life and in professional practice.

3.Assessment (1st and 2nd call)

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

There are two different ways in order to evaluate this course.

Continuous assessment:

In order to go to this evaluation method, students must obligatorily assist to, at least, an 80% of the classroom activities (seminars, lectures, lab sessions, etc.).

Continuous assessment activities include:

- **Individual assignments:** Various individual assignments during classroom sessions. Qualification will be between 0 and 10.
- **Lab sessions, reports, problem sets, case studies:** Development of various reports, elaboration of individual works and exercises resolution, etc. Qualification will be between 0 and 10. Being 4 the minimum qualification in a certain activity in order to average with other activities of this block. In order to average with other continuous assessment activities, students must obtain a minimum of 4 in the average of this block of activities. If such conditions are not satisfied, students will be excluded from continuous assessment. The teacher will plan the dates as well as the size of the groups of the lab sessions at the beginning of the course.
- **Midterm exams:** Voluntary midterm exams during class sessions. There will be a total of 3 of midterm exams. Qualification will be between 0 and 10. In order to average notes, students must obtain a minimum of 4 over 10 in each of these exams. In order to average with other continuous assessment activities, students must obtain a minimum of 4 in the average qualification of the three exams. If such conditions are not satisfied, students will be excluded from continuous assessment.

Weigthed average will be done according to the following table:

Contiuous assessment tasks	Weight
Individual assignments	10%
Lab sessions, reports, problem sets, case studies	30%
Midterm exams	60%

In order to pass the subject the weighted average must be of at least 5 over 10. Students that have not passed the subject, can pass the course through either two global assessment opportunities. On the other hand, students that have passed the subject through continuous assessment have the option of improving their qualification by doing the first of the global assessments; in such cases qualification can never decrease.

Global assessment:

Students that have not succeeded through continuous assessment or students interested in improving their qualification can opt for this assessment method.

Global assessment activities include:

- **Lab sessions, reports:** Development of laboratory sessions and reports. These activities will weight a 40% of the qualification. Qualification will be between 0 and 10 being 4 the minimum in order to average with the global exam.
- **Final exam:** It will include all the theory and practice of the course. Qualification will be between 0 and 10. This exam will weight a 60% of the qualification. Qualification will be between 0 and 10 being 4 the minimum in order to average with the other activities of global assessment.

Weighted average will be done according to the following table:

Global assessment tasks	Weight
Lab sessions, reports, problem sets, case studies	40%
Final exam	60%

In order to pass the subject students must obtain a minimum of 5 over 10 in the weighted qualification.

Those students that originally have opted for continuous assessment, have obtained a qualification of at least 5 in the continuous assessment tasks, but midterm exams, and have not succeed through continuous assessment. Can promote to the first call of the final exam their continuous assessment activities developed during the presencial course, but midterm exams, with an 40% of weight.

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning goals. It is based on participation and the active role of the student favors the development of communication and decision-making skills. A wide range of teaching and learning tasks are implemented, such as lectures, assignments, computer lab sessions, autonomous work, and tutorials. Students are expected to participate actively in the class throughout the semester.

This subject has 6 ECTS credits. This makes a total of 150 hours of effective work. The 40% of these hours (60 hours) will be classroom sessions.

Class work includes theory and practice sessions and laboratory experimental sessions.

Autonomus work includes personal study, problem resolution and development of practical works.

Semester consists in 15 weeks. Each week the student must work 10 hours in this subject.

A strong interaction between the teacher and the student is promoted. This interaction is brought into being through a division of work and responsibilities between the students and the teacher. Nevertheless, it must be taken into account that, to a certain degree, students can set their learning pace based on their own needs and availability, following the guidelines set by the teacher.

Teaching will be organized according to the following learning tasks:

-Lectures.

-Practice sessions.

-Laboratory sessions.

-Seminars.

-Tutorials.

-Exams.

Regarding to the slides, proposed exercise photocopies, laboratory session guides and other materials used in class, all of them are going to be available on the moodle platforma of this subject.

Theory and practice sessions will be developed within the classrooms indictated by the management team of the center. Laboratory sessions will be developed in the Physics laboratory of the EUPLA situated in the third floor of the building situated in the "Calle Mayor".

Further information regarding the course will be provided on the first day of class.

If due to health reasons the in-person teaching-learning process is not possible, it shall be carried out telematically.

4.2.Learning tasks

This 6 ECTS (150 hours) course is organized as follows:

- **Lectures**: (2 ECTS: 20 h). Theoretical activities carried out mainly through exposition by the teacher, where the theoretical supports of the course are displayed, highlighting the fundamental, structuring them in topics and or sections, interrelating them.
- **Practice sessions**: (2 ECTS: 20 h) The teacher resolves practical problems or cases for demonstrative purposes. This type of teaching complements the theory shown in the lectures with practical aspects.
- **Laboratory sessions**: (1.75 ECTS: 17.5 h). This work is tutored by a teacher, in groups of no more than 20 students.
- **Seminars:** (0.25 ECTS: 2.5 h) It is tutored by teachers from other subjects of this degree with the purpose to show the students the different applications of static structure in Building Engineering.
- **Autonomous work and study:** (90 hours).
    - Study and understanding of the theory taught in the lectures.
    - Understanding and assimilation of the problems and practical cases solved in the practice sessions.
    - Preparation of seminars, solutions to proposed problems, etc.
    - Preparation of laboratory workshops, preparation of summaries and reports.
    - Preparation of the written tests for continuous assessment and final exams.
- **Tutorials**: Those carried out giving individual, personalized attention with the teacher of the subject. These tutorials may be in person or online.
- **Exams:** The written assessment tests will be developed within the temporalization of theory and practice sessions.

If due to health reasons the in-person teaching-learning process is not possible, it shall be carried out telematically.

4.3.Syllabus

This course will address the following topics:

- Statics of particles
- System of forces and moment
- Equilibrium and reactions at supports and connections
- Friction
- Centroids and centres of gravity
- Distributed forces
- Fluid statics
- Analysis of structures
- Forces in beams and cables
- Moments of inertia of area
- Elasticity

4.4.Course planning and calendar

Estimated timetable of lectures:

Week	Topic	Theme
1 2	I	Statics of particles
3 4	II	System of forces and moment
5 6	III	Equilibrium and reactions at supports and connections, friction
7 8	IV	Centroids and centres of gravity, distributed forces and fluid statics
9 10	V	Analysis of structures
11 12	VI	Forces in beams and cables
13 14 15	VII	Moment of inertia of area and elasticity

Important dates, such as work presentations, laboratory practices, written exams, among other foreseen acitivities will be communicated to the students in the classroom or through the moodle platform enough time in advance. Seminars will be on friday. Such dates will be decided by the teacher and students will be informed with at least 15 days in advance in case of seminars and midterm exams and 7 days in advance in case of other assingment tasks.

Further information concerning the timetable (calendario y horarios), classroom, office hours, assessment dates (exámenes) and other details regarding this course will be provided on the first day of class or please refer to the EUPLA website (http://eina.unizar.es).

4.5.Bibliography and recommended resources

http://biblos.unizar.es/br/br_citas.php?codigo=28606&year=2020