



Universitat de Lleida

DEGREE CURRICULUM  
**STRENGTH OF MATERIALS  
AND STRUCTURAL DESIGN**

Coordination: LAMPURLANES CASTEL, JORGE

Academic year 2023-24

**Subject's general information**

<b>Subject name</b>	STRENGTH OF MATERIALS AND STRUCTURAL DESIGN			
<b>Code</b>	102571			
<b>Semester</b>	1st Q(SEMESTER) CONTINUED EVALUATION			
<b>Typology</b>	<b>Degree</b>	<b>Course</b>	<b>Character</b>	<b>Modality</b>
	Bachelor's Degree in Agricultural and Food Engineering	3	COMPULSORY	Attendance-based
<b>Course number of credits (ECTS)</b>	6			
<b>Type of activity, credits, and groups</b>	<b>Activity type</b>	PRAULA		TEORIA
	<b>Number of credits</b>	3		3
	<b>Number of groups</b>	1		1
<b>Coordination</b>	LAMPURLANES CASTEL, JORGE			
<b>Department</b>	AGRICULTURAL AND FOREST SCIENCES AND ENGINEERING			
<b>Teaching load distribution between lectures and independent student work</b>	60 master class 90 homework			
<b>Important information on data processing</b>	Consult <a href="#">this link</a> for more information.			
<b>Language</b>	Spanish			
<b>Distribution of credits</b>	29 hours of theory 31 hours exercises			

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
LAMPURLANES CASTEL, JORGE	jorge.lampurlanes@udl.cat	3	
LAMPURLANES CASTEL, JORGE	jorge.lampurlanes@udl.cat	3	

## Subject's extra information

Theoretical and practical course. Work using the recommended bibliography is very important.

The subject is studied in the 1st semester of the third year of the degree.

The communication with the teacher, outside of class, is through the Virtual Campus.

The content of the subject corresponds to that of Structural Analysis that is taught in the careers of architecture and engineering. The bibliographic search must be done with this title.

## Learning objectives

- Analyze and calculate the efforts that appear in the trusses structures
- Analyze and calculate the efforts that appear in the frame structures
- Draw diagrams of the corresponding efforts

## Competences

### University of Lleida strategic competences

- **UdL3.**- Master Information and Communication Technologies.
- Capacity of analysis and synthesis.
- To have the skills required to undertake new studies or improve the training with self-direction.
- Capacity of abstraction and of critical, logical and mathematical thinking.

### Degree-specific competences

- **GEE21.**- Ability to apply the technical rules to the building process and generate documents of technical specifications of the construction procedures and methods of the buildings.
- **GEE22.**- Aptitude to apply the specific rules about installations to the building process.
- **GEE23.**- Aptitude for the predimensioning, design, calculation and checking of structures and for the direction of their material execution.
- **GEE24.**- Ability to constructively develop the installations of a building, control and plan their execution and verify the service and reception trials as well as those regarding maintainance.

### Degree-transversal competences

- **EPS7.**- Ability to work in situations where information is lacking or you are under pressure.
- **EPS8.**- Ability to plan and organise the personal work.

## Subject contents

### First partial exam

- T1. - Structural Typology
- T2. - Analysis of structures
- T3. - Frames and Trusses
- T4. - Analysis of pin-jointed trusses
- T5. - Analysis of statically determinate trusses
- T6. - Analysis of statically indeterminate trusses. Castigliano's Theorem
- T7. - Deflections of trusses
- T8. - Roof Trusses

### Second partial exam

- T9. - Frames
- T10. - Analysis of statically determinate frames
- T11. - Analysis of statically indeterminate frames
- T12. - Matrix Stiffness Analysis of frames and trusses

## Methodology

**Lectures.** Explanations and powerpoint presentations made in class.

**Debate directed.** About the most important points developed in the theoretical part of the course.

**Problems.** The most significant and relevant exercises of the subject are solved in class.

It is a theoretical and practical subject. The homework using the recommended bibliography is very important.

The course develops theoretical concepts of each theme and then exercises that complement and facilitate the understanding of matter are done.

Throughout the explanations of the work that is being done, in each session, student must make questions required for complete understanding of the theoretical and practical developed content.

Professor will deliver, at the beginning of each theme, a summary. In any case this material replaces the books recommended for the study of the subject. The student needs a much more comprehensive understanding which can develop in class during an academic course.

This subject must be done when the student have the **Mechanics of materials** basic required concepts.

During the sessions in the classroom, teacher raises questions to which every student can answer. The result of this activity is a clear indicator of the level of study and understanding of the matter. It is a valuation of the subject that is very useful, both for the teacher and for the student.

All the issues are interlinked together. This makes impossible that the study of the subject can be done at the end, not serving, in this case, all the class attendance during the course.

## Development plan

Dates	Description:	Classroom activity	HTP (2) (Hours)	Personal activity	HTNP (3) (Hours)
	T1.- Structural typology	Theory	1	Theory	1,5
	T2.- Analysis of structures	Theory	2	Theory	3
	T3.- Frames and Trusses	Theory	1	Theory	1,5
	T4.- Analysis of pin-jointed trusses	Theory	5	Theory	7,5
	T5.- Analysis of statically determinate trusses	Theory (2) Problems (3)	5	Theory and problems	7,5
	T6.- Analysis of statically indeterminate trusses. Castigliano's Theorem	Theory (2) Problems (3)	5	Theory and problems	7,5
	T7.- Deflections of trusses	Theory (1) Problems (4)	5	Theory and problems	7,5
	T8.- Roof Trusses	Theory (2) Problems (3)	5	Theory and problems	7,5
First Partial	T1-T8	Theory			
First Partial	T1-T8	Problems			
	T9.- Frames	Theory	2	Theory and problems	3
	T10.- Analysis of statically determinate frames	Theory (3) Problems (6)	9	Theory and problems	13.5
	T11.- Analysis of statically indeterminate frames	Theory (4) Problems (8)	12	Theory and problems	18
	T12.- Matrix stiffness analysis of frames and trusses	Theory (4) Problems (4)	8	Theory and problems	12
Second Partial	T9-T12	Theory		Theory	
Second Partial	T9-T12	Problems		Problems	
Recovery	T1-T12	Theory and problems		Theory and problems	

## Evaluation

### Assessment:

- Block 1: Activities: 20% (minimum grade 5. Recoverable with a 5).
- Block 2: 1st exam: 40% (minimum grade 5).
- Block 3: 2nd exam: 40% (minimum grade 5).

### Observations:

- In order to pass, it is essential to pass all the exams and complete all the activities.

### Exams:

- The exams will have a theory part (30% of the mark) and a problems part (70% of the mark).

### Activities:

- They will be considered as **not delivered** if they are delivered outside the deadline.

### General criteria:

- Formal correction is required for the documents presented by the students, whether they are exams or activities.
- When correcting the exams and activities, the absence or incorrectness of the units in the numerical results, conceptual errors, gross errors or contradictions will be particularly penalized.
- The presence of any of the errors described here can be sufficient cause for an exam to be classified as suspended.

## Bibliography

### Recommended bibliography

### Recommended bibliography

#### Análisis estructural

R.C. Hibbeler

Editorial Pearson

#### Structural analysis in theory and practice

Alan Williams

Ed. Butterworth-Heinemann

#### Examples in structural analysis

Williams M.C: Mckenzie

CRC Press

#### Análisis de estructuras. Métodos clásico y matricial

J.McCormac, R.E. Elling

Editorial Alfaomega

**Análisis Estructural**

A.Kassimali

Ed.Cengage Learning

**Análisis matricial de estructuras de barras**

J. M<sup>a</sup>Iglesias

Ediciones de la UdL. Eines16