CU 9.3: DEVELOPMENT OF CONSTRUCTION PRODUCTS

Director of studies: **Laurent BLERON**

General CU objectives:

This module must provide the methods that make it possible to size complex structures.

In the first place, it is proposed to study how it is possible to size, within the regulatory framework, structural components or assemblies by experimentation.

Secondly, it will present how CLT structures and imperfectly connected structures such as concrete wood floors are sized and implemented.

Finally, digital tools used to analyse the global stability of structures with movable joints will be presented.

Consists of:

- Part 1: Sizing of imperfectly connected elements
- Part 2: Stabilisation of structures and IT implementation
- Part 3: Sizing and implementation of CLT
- Part 4: Experimental approach to sizing

Hourly volume

In-person		*Self-directed study*
28.00 H	**Lectures**	**50.00 H**
64.00 H	**Tutorials**	
0.00 H	**Practicals**	

Positioning of the CU in the School reference system:

after semester 8

Units of skills

In accordance with the RNCP sheet

Updated on 19 March 2025

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Part 1: Sizing of imperfectly connected elements	**Coefficient 1**
Session leaders: Clément CLAUDEL (CRITTBois), Lauréline ROY	
Teaching assistants:	
Prerequisites: sizing of straight components to Eurocode 5	
Teaching materials: Course notes – Presentation slides	
Assessment methods: individual Computer assignment	

Learning outcomes	**Description**	**Number of student hours (in-person)**		
		Lectures	**Tutorials**	**Practicals**
Be able to size mixed construction components incorporating assembly slippage whether they are composed of wood or of wood and other materials.	Slip behaviour in assembled elements can be modelled analytically or numerically in practice. The aim here is to present these methods theoretically: – Heimeshoff gamma method, – Kreuzinger numerical resolution, Finite beam model.	3.50	4.00	
	In order to apply the previous methods, an initial study will be conducted to carry out the sizing of a reconstituted wooden beam. A modelling approach will also be carried out in order to check the analytical approach.		8.00	
	Understanding of the manufacturing process for optimised LVL design. Presentation of concrete applications in construction with technical-economic analysis. Practical case studies.	3.50	4.00	
		7.00	**16.00**	**0.00**

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Part 2: Stabilisation of structures and IT implementation	**Coefficient 1**
Session leaders: Mathias HUMBERT	
Teaching assistants:	
Prerequisites: Knowledge of the technological principles of stabilisation of structures,	
Teaching materials: Course notes – Presentation slides	
Assessment methods: individual Computer assignment	

Learning outcomes	**Description**	**Number of student hours (in-person)**		
		Lectures	**Tutorials**	**Practicals**
Be able to size the standard stabilisation systems of current structures. Be able to define the principles of stabilization of a structure, to size it and to verify by digital simulation the operation of the complete structure.	Study of the principles of dimensioning the stability systems of standard structures in terms of rigidity and strength according to the regulatory approach of Eurocode 5.	1.75	6.00	
	Theoretical approach to the stability of structures and secondary effects: Reminder call of EULER'S theory, study on computer software of critical loads.	5.25	2.00	
	Study of an industrial building and definition of its system to ensure its stability. Modelling		8.00	
		7.00	**16.00**	**0.00**

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Part 3: Sizing and implementation of CLT	**Coefficient 1**
Session leaders: Michel DIDIER, Etienne LEROY	
Teaching assistants:	
Prerequisites: none	
Teaching materials: Course notes – Presentation slides	
Assessment methods: individual Report	

Learning outcomes	**Description**	**Number of student hours (in-person)**		
		Lectures	**Tutorials**	**Practicals**
Be able to implement CLT panels in ordinary structures: – Design technical details, – Size the panels, – Sizing assemblies.	Firstly, the aim is to explain the manufacture and the regulatory specificities of CLT (Cross Laminated Timber) construction components. The principles of mechanical operation and characterisation of this newly constructed material will be presented.	3.50	4.00	
	By presenting the production of different types of CLT structures, the fundamental principles of design of these structures will be explained. A large proportion will be devoted to the presentation of technical details.	3.50	4.00	
	Today, the sizing of a complete CLT structure is carried out by numerical calculation due to the plate-like behaviour of these panels: the aim here is to present the principles of modelling these panels and see IT implementation.		8.00	
		7.00	**16.00**	**0.00**

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Part 4: Experimental approach to sizing	**Coefficient 1**
Session leaders: Éric DIEBLING, HILTI company, WURTH company	
Teaching assistants: Stéphane AUBERT	
Prerequisites: Sizing of wooden rod assemblies	
Teaching materials: Course notes – Presentation slides – Use of a test slab	
Assessment methods: individual Report - Practical examination	

Learning outcomes	**Description**	**Number of student hours (in-person)**		
		Lectures	**Tutorials**	**Practicals**
Understand what constitutes innovation and when something can be considered innovative. Understand the complexity and limits of the innovation process in order to perceive the break-even point. Integrate the rigour that makes it possible to obtain reliable results. Integrate variability into the qualification of a product's properties.	The first part consists of general presentation of the principles of innovation in construction. The regulatory framework of the development and the main French key stakeholders through to the marketing of the products will be presented.	7.00		
	To grasp the complexity of innovation, it is then proposed, as a practical application, to carry out a "design by testing" approach on specific timber construction assemblies: –		8.00	
	Implement the protocol on the test slab and carry out a number of experiments.		4.00	
	Compile the results and produce a test report. Draw conclusions about the approach.		4.00	
		7.00	**16.00**	**0.00**