

Teacher(s)	Sgambi Luca ;
Language :	French
Place of the course	Tournai
Main themes	<p>This course aims to develop both theoretical and practical skills in the design of construction, infrastructure (buried structures), and complex structures. The course focuses on typologies of complex structures and emphasizes the development of comprehensive and coherent design strategies. These strategies consider spatial implications, the integration of technical systems, durability, and adaptability.</p> <p>Particular attention is given to the use of professional communication tools and the critical evaluation of technical and scientific documentation.</p>
Learning outcomes	<p>At the end of this learning unit, the student is able to : <u>Specific Learning Outcomes</u></p> <p>By the end of this course, students will be able to:</p> <ul style="list-style-type: none"> • Assess the behavior and properties of foundation soils, • Evaluate the specific challenges posed by key geotechnical elements to make coherent choices for buried structures, and define their design principles and execution conditions, • Analyze the spatial impact of large, complex structures, • Evaluate the technical and constructive principles required for large, complex structures and assess the associated execution methods and conditions, • Assess the sustainability of design and material choices, • Use specialized technical, scientific, and normative documents related to the topics covered, • Communicate effectively with stability engineers and construction professionals. <p><u>General Learning Outcomes</u></p> <p>In line with the program's learning outcomes (LOs), this course contributes to the development and acquisition of the following LOs:</p> <ul style="list-style-type: none"> • LO1.4 Compose the material elements of a construction or development with artistry. • LO1.6 Integrate Sustainable Development requirements into the design process, at multiple scales. • LO3.2 Understand and apply the construction and technical processes related to architecture. • LO3.3 Understand and integrate scientific and technical knowledge to realize an architectural project. • LO3.4 Understand and assess the environmental, social, and economic consequences of construction and technical choices. • LO4.4 Understand and assess the environmental, social, and economic consequences of architectural choices. • LO5.1 Act in full awareness of one's responsibilities. • LO5.2 Communicate attentively, inclusively, and effectively with the various stakeholders of the architectural project.
Evaluation methods	Each student's final grade is the average of two grades. The first assessment is based on a structural design project on a design problem assigned by the instructor at the beginning of the course (4 points out of 20). This project may be done in groups. The second assessment is a written exam on the topics covered in class (16 points out of 20).
Teaching methods	The course includes a portion of theoretical lectures, a portion of the course devoted to exercises, and the development of a structural design exercise.
Content	<p>Recalls of limit state regulations (semi-probabilistic approach, safety coefficients, load combinations).</p> <p>Steel structures</p> <p>Overview of the material and elements in commerce.</p> <p>Ultimate limit state verification methods for elements in tension (ties), in compression (columns) and for elements in bending (beams).</p> <p>Application to the State Seminary project, by architect Alain-G. Tschumi. Discussion of global static schemes, design of a composite deck slab, design and verification of a secondary beam and a main beam. Calculation of a cellular beam. Analysis of bolted and welded connections. Analysis of construction details.</p> <p>Application to the school building project "Quasimodo" by architect A. L. Rizzo. Discussion of static schemes. Design and verification of a suspension tie-rod. Sizing of suspension beam in roof (non-commercial) of 1.5 m height.</p> <p>Introduction to the structures present in the projects of architect Toyo Ito, 2001.</p>

	<p>Application to the Sendai Mediatheque project of architect Toyo Ito. Analysis of the conceptual justifications. Analysis of the project's structures and their implementation. Recalls of Eulerian instability theory. Sizing of an element of a tube system.</p> <p>Application to the Tama Art University project by architect Toyo Ito, 2007. Analysis of conceptual motivations. Analysis of the project structures and their implementation. Elements of the behavior of arches. Elements of earthquake engineering (difference in approach between the two Ito projects examined). Discussion about hybrid steel-concrete structures.</p> <p>Application to the project of the Kanagawa Institute of Technology Workshop, Ishigami, 2010. Analysis of conceptual motivations. Analysis of the structures and their implementation. Simplified seismic analysis of the building (equivalent static forces). Analysis of snow loads. Demonstration by calculation of the need to pre-stress the columns due to snow load. Remarks on the interaction between architectural and structural choices and differences with Toyo Ito's approach.</p> <p>Timber structures</p> <p>Overview of the material and elements in commerce.</p> <p>Ultimate limit state verification methods for compression elements (columns) and bending elements (beams).</p> <p>Analysis of connection types.</p> <p>Analysis of the Steilneset Memorial for the Victims of the Witch Trials project by architect Peter Zumthor.</p> <p>Application to The Regional Center of craftsmanship project by architect Peter Zumthor. Sizing of one of the roof beams. Discussion of the mode of connection used in the project.</p> <p>Overview of some of Kengo Kuma's projects.</p> <p>Reinforced concrete structures</p> <p>Overview of the material.</p> <p>Ultimate limit state verification methods for elements in compression (columns) and for elements in bending (beams). Design and verification of longitudinal steel (bending moment reinforcement) and stirrups (shear stress reinforcement).</p> <p>Application to the Casa del Fascio project, by architect Terragni.</p> <p>Direct and deep foundations</p> <p>Retaining walls</p> <p>Prefabricated concrete structures: design process and choice of construction system, general stability and bracing, flat and ribbed prestressed floor elements, assemblies and brackets.</p>
<p>Inline resources</p>	<p>To support the course, the professor makes MOODLE modules available that cover all the topics discussed.</p>
<p>Faculty or entity in charge</p>	<p>LOCI</p>

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Architecture (Tournai)	ARCT2M	5		