


4 credits

20.0 h + 15.0 h

Q2

Teacher(s)	Cap Jean-François ;
Language :	French
Place of the course	Louvain-la-Neuve
Main themes	<ul style="list-style-type: none"> • The properties of the materials (concrete and steel); prestressing and post-stressing techniques; forces equivalent to prestressing; the calculation of prestress losses; the calculation and design of prestressed concrete beams subjected to normal force, bending, shear force and torsion; pre-design methods; design of the anchoring zones, deflections. • These topics are addressed in the context of SLS design (elastic behaviour hypothesis) and ULS design (plastic behaviour hypothesis). • The calculation methods presented refer to the rules prescribed in current European standards (Eurocode 2).
Aims	<p>With reference to the AA reference framework of the "Master Civil Engineer of Constructions" program, this course contributes to the development, acquisition and evaluation of the following learning outcomes: AA1.1, AA1.2, AA1.3, AA2.1, AA2.2, AA2.3, AA2.4, AA3.1, AA5.3, AA5.4</p> <p>More specifically, at the end of this course, the student will have acquired a theoretical and practical knowledge of the prestressed and post-stressed concrete structures design methods.</p> <p>1 He/she will be able to design simple elements in prestressed concrete (beams, slabs, ...) according to the European standards (Eurocode 2).</p> <p>This includes the design of concrete sections, prestress reinforcement and the drawing of formwork plans, reinforcement plans and the definition of tensioning steps.</p> <p>He will be able to chose the various techniques of pre / post stressing.</p> <p>He will also master the fundamental concepts of prestressed concrete theory that will allow him to address problems related to larger scale projects.</p> <p>-----</p> <p><i>The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled "Programmes/courses offering this Teaching Unit".</i></p>
Evaluation methods	<p>The evaluation has two parts:</p> <ul style="list-style-type: none"> • Open-book written examination with practical exercises related to the design of simple reinforced concrete structures (4h). • Oral exam with 'closed book' related to the theoretical concepts of the course. <p>The success of both parties is required.</p>
Teaching methods	<p>Ex-cathedra lectures with Powerpoint slides.</p> <p>Workshops and exercices</p>
Content	<ul style="list-style-type: none"> • History of prestressed concrete • Principles of prestress • Field of application of prestressed concrete • Properties of steels • Prestressed systems • Loads equivalent to prestress • Load balancing and deformation compensation • Calculation of the prestress force • Calculation of stresses (Elastic field) • ULS design of bended beams • Shear strength of prestressed sections • Prestress losses • Pre-design of prestressed elements • Localized efforts: end zones of prestressed beams
Inline resources	<p>Available on Moodle : Powerpoint slides, Exercices.</p>

Bibliography	<ul style="list-style-type: none">• Transparents du cours (syllabus) et formulaire EN 1992-1-1+ ANB ;• Norme NBN EN 1992-1-1 - Eurocode 2 : Calcul des structures en béton - Partie 1-1 : Règles générales et règles pour les bâtiments• René Walther, Manfred Miehlsbradt. Dimensionnement des structures en béton - Traité de Génie Civil Volume 7 . Presses polytechniques et universitaires romandes.• R. Favre, J.-P. Jaccoud, O. Burdet, H. Charif. Dimensionnement des structures en béton - Traité de Génie Civil Volume 8 . Presses polytechniques et universitaires romandes.
Faculty or entity in charge	GC

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Civil Engineering	GCE2M	4		
Master [120] in Architecture and Engineering	ARCH2M	4		