

Dr Emmanuel Denarié, Senior Scientist (MCS/IIC/ENAC/EPFL), Thursdays from 8 h 15 to 12 h, Room GC B2 424

Module	Date	Content	Lect.	Exercise
1	08.11.2018	Introduction, motivation, historical perspective, HPFRCC families, strength vs deformability, components and features of UHPFRC, typical applications  FRC - bases of mechanical behaviour, fibres, bond, effects of orientation, characterization of mechanical performance	1.5  2.5	
2	15.11.2018	Hydration of binders and effects of mineral additions (SCM): reactions, degree of hydration, hydration kinetics and influence factors, maturity, effects of high and low temperatures, micro and mesostructure of UHPFRC (hydrates, pore structure)  <u>Exercise 1:</u> Heat of hydration – comparative analysis of test results	3	1
3	22.11.2018	Rheology at fresh state, superplasticisers  <u>Exercise 2:</u> UHPFRC batch test, analysis, interpretation	2	2
4	29.11.2018	Formulation of UHPFRC, optimisation of packing density vs rheology / strength vs deformability  Mechanical properties of UHPFRC (quasi-static), ageing, orientation effects of fibres, combination with rebars, SCM  Time dependent mechanical response: low strain rates (creep, shrinkage), early age, long term, fatigue, high strain rates	1  1  2	
5	06.12.2018	Transport properties of UHPFRC (moisture, liquids and gases), durability, effects of “damage-cracking”  Modelling of the mechanical response of tensile strain hardening / softening composites, scale effects , inverse analysis, design with analytical models	1  3	
6	13.12.2018	<u>Exercise 3:</u> Numerical modelling of UHPFRC (mechanical) with FEM / NLFM		4
7	20.12.2018	Design of structures with UHPFRC, fire resistance, recycling, Life Cycle Analysis, examples of applications  Synthesis  <u>Exercise 4:</u> Group works and presentations, discussion, closure	2	2