S5 – Advanced Concrete Technology, CE7S05 [5 credits]

Module co-ordinator(s): Associate Prof. Roger P. West (rwest@tcd.ie)

Lecturer(s): Prof. Ravindra Dhir, Prof. Sara Pavia, Prof Roger P. West

Module description, aims and contribution to programme
To introduce advanced concepts in understanding concrete technology, particularly behaviour, production and use in practice. The aim is to prepare the student for early career design and construction practice, material specification and practical problems in the use of concrete in all its forms. It builds on, but does not require as a prerequisite, the 4A1 elective in Civil Engineering Materials, but focuses on concrete, as the most commonly used construction material in Ireland.

Module organisation
First: Weeks 1-10
Lectures 27
Assignments 10
Directed learning 26
Autonomous learning 37
Total 100
Note: 1 ETCS is 20 hrs of student effort

Learning outcomes
On successful completion of this subject the student will be able to:
1. Identify suitable cementitious materials for use in practice
2. Demonstrate a deep understanding of the principal fresh and hardened properties of concrete
3. Understand the mechanisms and prevention of durability problems in concrete
4. Utilise concrete technology solutions in practice on site

Demonstrate an awareness of the application of statistics in relation to concrete.

Module content
1. The constitution, specification and hydration of Portland Cement
   Chemical composition, cement properties, international standards, hydration, setting and hardening.
2. Pozzolans
   Types, reactivity, mechanical and durability characteristics
3. Properties of concrete
   Workability and rheology, strength, impact, maturity, creep, shrinkage and thermal properties, porosity, permeability, and diffusion
4. New concrete processes and products
Admixtures, high strength concrete, self-compacting concrete, fibres, shotcrete, insulated concrete formwork, rolled reinforcement.

5. Applied Statistics
Variability, regression, curve fitting, significance testing, Student t-test

**Teaching strategies**
- Core content via lecture (direct)
- Background reading

**Assessment**
Term Assignment including presentation (10%); Examination (90%)

**Required textbook**
None

**Further information**
School of Engineering weblink.