# LLL course description form

Type of learning: Hybrid Blended learning

Workload for the learner: 10 hours teaching+50 hours self-learning = 60 hours (2 ECTS)

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| Title:  | **Durability of concrete structures** |
| Learning Outcomes: | The course should provide the students with an understanding of the typical mechanisms of deterioration of reinforced concrete structures and ability to predict the service life and suggest mitigating measures and repair strategies.Knowledge:- Detailed understanding of typical deterioration mechanisms and controlling parameters- Basic understanding of methods for inspection of concrete structures - both field and laboratory methods- Basic understanding of methods for maintenance and repair of concrete structuresSkills:- Ability to plan an inspection of a typical reinforced concrete structure- Ability to undertake (non-structural) assessment of a typical concrete structure- Ability to propose mitigating measures and repair strategies.General competence:- Ability to reflect and argue on a scientific basis- Ability to use theory for solving engineering problems. |
| Method/s for teaching and learning:  | LecturesReading materialTerminologyVideosIndividual research and written report |
| Content/short description: | The course introduces you to the deterioration mechanisms of concrete material under different environmental actions including carbonation, chloride ingress, freeze-thaw cycles, leaching, salt crystallization, sulfate corrosion (mechanisms, influential factors and models) and their influence on steel corrosion.This basic knowledge about mechanisms, influential factors and models enables to treat concrete deterioration in structural context to understand the effect of loading and cracking.Next step is to provide the information about approaches and methods for durability design of concrete structures. The most important part in this course is the assessment of the deterioration of concrete structures using different measurement laboratory and in-situ methods that gives further directions for repairing of the structure. |
| Structure of the course: | 1. Mechanisms of concrete deterioration

Carbonation and induced steel corrosion; Chloride ingress and induced steel corrosion; Freeze-Thaw Damage; Leaching; Salt crystallization; Sulfate corrosion1. Specification and design of durable concrete.
2. Inspection of concrete structures

Laboratory and in-situ methods.1. Maintenance and repair of concrete structures (according to EN1504)
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| Preparer of the course:  | Toni Arangjelovski |
| Method/s of assessment\*: |  |
| Method for evaluation of course (by students, peer review etc.): | Anonymous polling |

\* Optional, in case if the learner requires certificate for the 2 ECTS issued.