

Bachelor Themes SFE – branch D

Thematic area: Concrete and Masonry Structures

Topic 1: Technology of concrete, properties of concrete and reinforcement, principles and methodology of designing, prestressed concrete, masonry structures

- 1) types of concrete, basic properties of concrete
- 2) component of concrete – types, properties, testing, influence on concrete properties
- 3) manufacturing of concrete + processing and curing of fresh concrete
- 4) testing of fresh and hardened concrete
- 5) specification of concrete
- 6) strength and deformation properties of concrete, stress-strain diagram
- 7) volume changes of concrete – concrete shrinkage and creep
- 8) classification of reinforcement according to material, properties of reinforcement and prestressing steel
- 9) interaction of concrete and steel – bond, cover, anchorage
- 10) principles of partial safety factors for designing of concrete structures (limit state approach)
- 11) loading of concrete structures – terms, examples of calculation of load
- 12) design of reinforced concrete members – reliability for ultimate limit state and serviceability limit state
- 13) behaviour of un-reinforced (plain) concrete members for particular types of loading
- 14) behaviour of reinforced concrete members for particular types of loading
- 15) function and types of reinforcement in concrete members for variant manners of loading
- 16) principles of prestressed concrete, pre-tensioned and post-tensioned concrete,
- 17) prestressed concrete – losses of prestress, design of prestress (principles of balancing stress and load)
- 18) check of prestressed members – reliability for ultimate and serviceability limit states, design of anchor zones, separation
- 19) types of masonry, properties and symbols of masonry units
- 20) properties of masonry, bond
- 21) vertical resistance of masonry, masonry subjected to concentrated loads
- 22) models for the design of masonry buildings
- 23) laterally loaded masonry – bending, shear
- 24) masonry shear walls, shear design of masonry
- 25) strengthening and reinforcing of masonry

Topic 2: Design of concrete structural members and structures

- 26) stress states of bended concrete members, failure modes
- 27) resistance of bended members of various types of sections and reinforcement
- 28) shear resistance of concrete members – failure modes, design of shear reinforcement
- 29) resistance of concrete members in punching – failure modes, reinforcement
- 30) resistance of torsion members – failure, principles of the design
- 31) principles of the design of concrete members loaded with combination $M + N$, failure modes

- 32) resistance of concrete members loaded with combination of M + N
- 33) slender concrete members – slenderness, check of the resistance of slender elements
- 34) serviceability limit states of concrete members – stress limits, ideal cross-section
- 35) serviceability limit states of concrete members – cracking, width of cracks
- 36) serviceability limit states of concrete members – deflection of bended elements
- 37) calculation models and methods for concrete structures
- 38) structural members of concrete structures – terminology, characteristics
- 39) types and properties of concrete slab structures, behaviour
- 40) one-way concrete slabs – structural models and calculation methods, reinforcing
- 41) concrete slabs supported along edges – structural models and calculation methods, reinforcing
- 42) flat slabs – geometry, structural arrangement, structural models and calculation methods, reinforcing
- 43) stiffening of multi-storey buildings, structural arrangement, shear walls – proportioning of loads, reinforcing
- 44) concrete frame structures – structural models and calculation methods, reinforcing
- 45) concrete staircase – types, structural models and calculation methods, reinforcing
- 46) concrete basements walls – types, effects of earth pressure, structural models and calculation methods, reinforcing
- 47) concrete retaining walls – types, effects of earth pressure, structural models and calculation methods, check of resistance including stability check, reinforcing
- 48) concrete basements – types, structural models and calculation methods, reinforcing
- 49) concrete precast elements, specifics of the design, temporary design situations, manipulation
- 50) concrete precast structures of multi-storey buildings – specifics of the design, temporary design situations, connection of elements, spatial rigidity
- 51) concrete hall structures – loading, structural arrangement, spatial rigidity, crane tracks