



Issues for the Master's diploma exam

Field of study: Civil engineering

Area of study (specialization) **Structural Engineering (SE)**

Building engineering	
No	Issues
1	List and describe the most important steps of structural design process. Perform the comparison of mechanical characteristics of main constructional materials.
2	BIM in construction - characteristics, application possibilities
3	Aluminum-glass facades and other materials (eg. sandwich panels)
4	Idea of sustainable building and Idea of Passive building - basic and design requirements (location, shading, technical requirements etc) /
5	Heat gains and losses in building, overheating
6	Describe classification and draw examples of cable structures
7	Characterize materials and constructions of cables.

Building materials	
No	Issues
1	Division and examples of high buildings known to you
2	Execution technology and description Burch Dubai building
3	Description of the tallest building in your country
4	Fiber reinforced concrete and ultra-high performance concrete
5	Industrial ground floors

Construction Engineering and Management	
No	Issues
1	Stages of the construction process and persons responsible for their compliance with legal provisions
2	Typical organizational structures of enterprises (advantages and disadvantages)
3	Deming principles
4	Quality management tools
5	Rules for expansion joints in industrial floors

Concrete structures	
No	Issues
1	Classification and erecting methods of shells, silos and tanks.
2	Actions on shells, silos and tanks.
3	Cross-sectional forces in shells, silos and tanks and how to determine them – methods based on the concept of membrane state and bending state.
4	Influence of the joint between the wall and foundation of a silo or tank on the distribution of internal forces in the structures.
5	Principles of reinforcement in concrete shells, silos and tanks and their foundations.
6	Properties of materials, types of prestressed concrete structures and methods for their manufacturing.
7	Design principles of prestressed concrete structures.
8	Profile shaping of prestressed concrete structures.
9	Losses in prestress of prestressed concrete.
10	Anchorage in pre-tensioned and post-tensioned concrete.



Steel structures	
No	Issues
1	Assumptions and rules of design for trusses.
2	Static schemes and construction of steel industrial halls.
3	Principles of shaping and dimensioning of bracing in steel hall structures.
4	Types of imperfections and their impact on the analysis of steel structures.
5	Global and local stability in steel compressed, eccentrically compressed and bent bars.
6	Principles of constructing and dimensioning steel structure joint and connections. Failure mechanisms.
7	Design principles of thin-walled steel structures.
8	Towers and masts - general principles of construction and design procedures.
9	Steel spatial and tension structures - general principles of shaping and design.
10	Protection of steel structures against corrosion and fire.

Computer Aided Design	
No	Issues
1	Define the task of linear statics (3D description) in the framework of the finite element method using the principle of virtual works.
2	Define the task of linear statics (3D description) in the framework of the finite element method using the theorem on the minimum potential energy.
3	Discuss the task of non-linear statics in the framework of the finite element method.
4	Discuss the problem of initial stability in the framework of the finite element method.
5	Discuss the determination of eigenfrequencies and eigenvectors in the framework of the finite element method.
6	Discuss the task of linear dynamics and provide an overview of methods of solution in the framework of the finite element method.
7	List and briefly describe the methods of time integration of equations of motion in the framework of the finite element method.
8	Give examples and briefly characterize selected models of physical non-linearity.
9	Discuss the task of linear thermomechanics.
10	Discuss the task of nonlinear thermomechanics.

Buliding Mechanics	
No	Issues
1	Computation and application of influence lines.
2	Types and methods of damping in engineering structures.
3	Determination of mass and stiffness matrices in frames.
4	Cross-sectional plastic index of resistance.
5	Designing of block foundations for machines.
6	Strain tensor, stress tensor and physical law.
7	Matrix version of stiffness method.
8	Matrix version of stability analysis in frames.
9	Engineering method of static analysis of axi-symmetric shells.
10	Cable structures - examples, static computations.



Strength of materials	
No	Issues
1	General state of strain
2	General state of stress
3	Complex constitutive models for structural materials
4	Plate structures
5	Shell structures
6	Global buckling in structures
7	Local buckling in structural elements
8	Steel, concrete and composite structures in fire
9	Structural modeling of construction and actions
10	Multidisciplinary building information modeling

Surveying	
No	Issues
1	Basic map / Map for design purposes
2	Records of lands and buildings / The map of land registry / Land and Mortgage Register / Local Spatial Development Plan
3	Techniques of land surveys (total station, GNSS, laser scanning)
4	Geodetic measurements before, during and after the completion of construction works
5	Diagnostic surveys

Geology	
No	Issues
1	Mechanical soil parameters.
2	Settlements vs consolidation.
3	Displacement piles, methods, advantages and disadvantages.
4	Lateral earth pressure. Types of retaining structures.
5	Bearing capacity of a single pile.