Study plan

Name of study plan: Structural Analysis of Monuments and Historical Constructions

Faculty/Institute/Others:
Department:
Branch of study guaranteed by the department: Welcome page
Garantor of the study branch:
Program of study: Structural Analysis of Monuments and Historical Constructions
Type of study: Follow-up master full-time
Required credits: 60
Elective courses credits: 0
Sum of credits in the plan: 60
Note on the plan:

Name of the block: Compulsory courses
Minimal number of credits of the block: 60
The role of the block: Z

Code of the group: SAHC202401
Name of the group: Structural Analysis of Monuments and Historical Constructions
Requirement credits in the group: In this group you have to gain at least 60 credits
Requirement courses in the group: In this group you have to complete at least 8 courses
Credits in the group: 60
Note on the group:

Code	**Name of the course / Name of the group of courses** ***(in case of groups of courses the list of codes of their members)*** *Tutors,* ***authors*** *and guarantors (gar.)*	Completion	Credits	Scope	Semester	Role
132SBSD	**Seismic Behaviour and Structural Dynamics** *Petr Kabele* ***Petr Kabele*** *Petr Kabele (Gar.)*	ZK	5	3P+7C	Z	z
132HCC	**History of Construction and of Conservation** *Petr Kabele* ***Petr Kabele*** *Petr Kabele (Gar.)*	ZK	5	3P+7C	Z	z
132IDIA	**Inspection and Diagnosis of Historical Buildings** *Petr Kabele* ***Petr Kabele*** *Petr Kabele (Gar.)*	ZK	5	3P+7C	Z	z
132RCM	**Restoration and Conservation of Materials** *Petr Kabele* ***Petr Kabele*** *Petr Kabele (Gar.)*	ZK	5	3P+7C	Z	z
132SAT	**Structural Analysis Techniques** *Petr Kabele* ***Petr Kabele*** *Petr Kabele (Gar.)*	ZK	5	3P+7C	Z	z
132RST	**Repairing and Strengthening Techniques** *Petr Kabele* ***Petr Kabele*** *Petr Kabele (Gar.)*	ZK	5	3P+7C	Z	z
132IPR	**Integrated Project of Historical Buildings** *Petr Kabele* ***Petr Kabele*** *Petr Kabele (Gar.)*	ZK	9	12C	L	z
132DISA	**Masters Thesis** *Petr Kabele, Petr Fajman, Michal Hlobil* ***Petr Kabele*** *Petr Kabele (Gar.)*	Z	21	2C	L	z

Characteristics of the courses of this group of Study Plan: Code=SAHC202401 Name=Structural Analysis of Monuments and Historical Constructions

132SBSD	Seismic Behaviour and Structural Dynamics	ZK	5

Introduction to earthquake engineering. Elements of seismology and seismicity. Elements of seismic hazard analysis. Dynamic analysis of single-degree-of-freedom systems. Dynamic analysis of multi-degree-of-freedom systems. Dynamic analysis of structures using the finite element method. Response spectrum analysis of linear multi-degree-of-freedom systems. Response history analysis of linear multi-degree-of-freedom systems. Non-linear dynamic and static analysis of structures. Earthquake-resistant design of buildings. Structural dynamics in building codes. Elements of soil dynamics. Damage and collapsing mechanisms in existing (particularly historical) structures. Introduction to innovative earthquake-resistant systems.

132HCC	History of Construction and of Conservation	ZK	5

Introduction to modern conservation criteria. General concepts. Structural conservation and restoration. Construction techniques and structural components: masonry and earth. Construction techniques and structural components: timber and mixed systems. Construction techniques and structural components: metals. The use of metals in historical construction. Introduction to 20th century heritage structures. Structural concrete across 20th century. Overall structural arrangements in history. Ancient rules and classical approaches. Limit analysis: the static and the kinematic approach. Damage and collapsing mechanisms in historical structures: gravity and soil settlements; construction defects. Damage and collapsing mechanisms in historical structures: environmental and anthropogenic actions. History of conservation. The Athens Charter and the Venice Charter. Modern structural restoration practice. The application of conservation criteria in practice. Diagnosis, safety evaluation and design of intervention. Examples. Discussion of analysis and restoration of real heritage structures.

132IDIA	Inspection and Diagnosis of Historical Buildings	ZK	5

General methodology for inspection and diagnosis. Documentation of historic structures, typical damage and visual inspections. Soils and rocks in situ investigation and monitoring. In situ investigation of timber, steel and concrete structures. In situ NDT and MDT for masonry structures. Complementarily of NDT and MDT and case studies presentation. Laboratory load tests and in situ load tests. Monitoring of historic structures. Monitoring analysis and cyclic effects. Modal testing of historic structures. Structural assessment.

132RCM	Restoration and Conservation of Materials	ZK	5
Introduction to conservation and restoration of materials. Historical materials: identification, types and classification. Binders and mortars. Degradation of historic materials: physical, chemical and biological actions. Degradation of historic materials: disasters and anthropogenic actions. Salts in stone and masonry. Cleaning of façades. Repair materials and techniques. Consolidation of degraded brick and masonries. Consolidation of degraded mortar and plaster and interaction with fixed artistic heritage. Protective and coating layers. Restoration and conservation of wood. Deterioration and conservation of metals. Deterioration and conservation of 20th century heritage concrete and modern materials. Technical excursion. Laboratory works and in-situ investigations.			
132SAT	Structural Analysis Techniques	ZK	5
Aims, chalenges and difficulties in the modeling and analysis of historical structures. Governing equations of the mechanics of continuum. The finite element method. Elasto-plastic constitutive models. Geometrical nonlinearity. Solution procedures for non-linear incremental FE analysis. Damage mechanics, smeared crack models. Applicability of continuum mechanics. Blocky limit analysis of masonry. Demonstration of modelling of real structures and examples.			
132RST	Repairing and Strengthening Techniques	ZK	5
Introduction to repair and strengthening. Strengthening of foundations. Discussion of load transfer and long term effects. Strengthening of concrete structures. Strengthening of metal structures. Design of timber structures. Strengthening of timber structures. Design of masonry structures. Strengthening of masonry structures. Strengthening solutions.			
132IPR	Integrated Project of Historical Buildings	ZK	9
This unit is composed of three main parts, as follows: Field trips with presentations on case studies. Seminars on conservation subjects not addressed in the course. Analysis of case studies in groups of 3 to 5 students. Within this unit, students have to develop the inspection, diagnosis, stability analysis, design project, monitoring and maintenance plans of a case study.			
132DISA	Masters Thesis	Z	21
The Dissertation aims at developing research and/or professional competences in the field of conservation and restoration of architectural heritage structures. Students may develop research, compilation or case study theses.			

List of courses of this pass:

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The Dissertation aims at developing research and/or professional competences in the field of conservation and restoration of architectural heritage structures. Students may develop research, compilation or case study theses.			
132HCC	History of Construction and of Conservation	ZK	5
Introduction to modern conservation criteria. General concepts. Structural conservation and restoration. Construction techniques and structural components: masonry and earth. Construction techniques and structural components: timber and mixed systems. Construction techniques and structural components: metals. The use of metals in historical construction. Introduction to 20th century heritage structures. Structural concrete across 20th century. Overall structural arrangements in history. Ancient rules and classical approaches. Limit analysis: the static and the kinematic approach. Damage and collapsing mechanisms in historical structures: gravity and soil settlements; construction defects. Damage and collapsing mechanisms in historical structures: environmental and anthropogenic actions. History of conservation. The Athens Charter and the Venice Charter. Modern structural restoration practice. The application of conservation criteria in practice. Diagnosis, safety evaluation and design of intervention. Examples. Discussion of analysis and restoration of real heritage structures.			
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