

SYLLABUS

Name: Maintenance, Repair and Strengthening of Structures (BudAB>SI8MRASOS19)

Name in Polish:

Name in English: Maintenance, Repair and Strengthening of Structures

Information on course:

Course offered by department: Faculty of Civil Engineering
Course for department: Silesian University of Technology

Default type of course examination report:

ZAL

Language:

English

Course homepage:

<https://platforma.polsl.pl/rb/course/view.php?id=804>

Short description:

The course provides revision of problems and methods connected with the assessment, repair and strengthening of different types of structures (masonry, timber, reinforced concrete, steel) for historical, urban, and industrial buildings. The course covers aspects related to building maintenance, structural inspections, types of inspections and the scope of construction expertise.

The course broadly discusses the causes of damage to various types of buildings, including the influence of the subsoil, mechanical and non-mechanical, dynamic, environmental influences, ageing, fatigue and corrosion.

The student gets acquainted with modern methods and tools for the inspection of various types of structures.

The course presents methods of SHM, including techniques based on Vibration and Vision Methods, Data and Model Driven Methods based on ANN. The student learns about modern, innovative diagnostic techniques and devices based on UAV and robots, self-monitoring structures, etc.

Description:

Lectures (20h):

Causes of construction disasters. Building maintenance. Monitoring and diagnostics of buildings. Counteracting disasters and building damage. Causes of structural damage. Types of damage to structures of various types: masonry (taking into account the specificity of historic buildings), wooden, steel and concrete. Consequences of building damage.

Methods of repairing structures made of various materials. Traditional and modern methods of structural reinforcement.

Overview of construction diagnostics techniques and devices. Overview of construction monitoring methods. Structural Health Monitoring. Modern, innovative methods of locating structural damage. Methods of assessing the safety of structures. BIM. The digital twin of construction. Intelligent constructions.

Seminar (10h):

Individual presentations of students on chosen subjects or case studies related to the scope of the course.

Bibliography:

1. Naprawa i ochrona konstrukcji betonowych. Lech Czarnecki, Peter H. Emmons. Kraków 2002

2. fib Bulletin 14 (Triafantafillou T. et al.) Externally bonded FRP reinforcement for RC structures. fib, July 2001.

3. fib Bulletin No. 102. Guide for Protection and Repair of Concrete Structures. Guide for good practice (291 pages, ISBN 978-2-88394-155-7, March 2022)

4. fib Bulletin No. 103. Guide for Strengthening of Concrete Structures. Guide for good practice (316 pages, ISBN 978-2-88394-158-8, May 2022)

5. The Athens Charter for the Restoration of Historic Monuments, 1933

6. The Venice Charter for the Conservation and Restoration of Monuments and Sites, 1964

Learning outcomes:

K1A_W05

Student knows the principles of construction, dimensioning, strengthening and repair of construction elements: metal, reinforced concrete, composite, timber and masonry, as well as selected construction elements of bridge/communication construction.

K1A_W10

Student knows fundamental dilemmas of contemporary civilization, prospects for the development of construction and consequences of the impact of construction investments on the environment, as well as the impact of environmental factors on the durability of buildings.

K1A_U14

Students know how to use their knowledge - formulate and solve complex and unusual problems and perform tasks in conditions not fully predictable by: - appropriate selection of sources and information derived from them, evaluation, critical analysis and synthesis of this information, - selection and application of appropriate methods and tools, including advanced information and communication technologies

Assessment methods and assessment criteria:

Demanded participation in lectures, presentations and discussions during seminars. (20%)

Individual evaluation is based on the presence, activity and quality of the presentation. (80%)

The final grade for the course is determined on the basis of the grade obtained in the project classes. Final grade = 0.8x Seminar grade + 0.2 Grade for the presence and activity during lectures and seminars.

The final grade will be determined based on the assessment obtained from the following method of verifying learning outcomes:

1. Verification of practical skills – preparation of an individual presentation on an agreed topic.

Assessment criteria:

5 points = independent and error-free preparation of the presentation, full attendance at all classes, high student engagement in project development, high quality of work, very good, independent delivery of the presentation, correct interpretation, ability to answer questions related to the completed work correctly; grade: 5.0

4 points = good and independent preparation of the presentation, attendance at all practical classes (with one unexcused absence allowed), average student engagement in project development, average quality of work, good, independent delivery of the presentation, correct interpretation, ability to answer questions related to the completed work correctly; grade: 4.0

3 points = sufficient but not fully independent preparation of the seminar, attendance at all practical classes (with two unexcused absences

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allowed), low student engagement in project development, low quality of work, inconsistent delivery of the presentation, incomplete interpretation, ability to answer only some questions related to the completed work; grade: 3.0

2 points or fewer = insufficient, non-independent preparation of the presentation or failure to submit it within the required timeframe, absence from classes, low student engagement in preparing the presentation, low quality of work, inconsistent delivery, incorrect interpretation, inability to answer questions related to the completed work; grade: 2.0 – task not passed, requiring resubmission.

2. Method and procedure for making up for deficiencies resulting from:

student absence from classes,
differences in curricula for students transferring from another field of study, another university, or resuming studies at the Silesian University of Technology.

Two absences from lectures and seminars are permitted; each subsequent absence requires making up for the missed content by presenting the current progress of the project and giving an oral report on independently completed project work during the next class or during consultations.

Curriculum differences will be addressed by the student through the preparation of a seminar paper on an assigned topic and its public discussion within the student group.

4. Prerequisites and additional requirements, including the sequence of classes:

Completed courses: Concrete Structures, Masonry Structures, Steel Structures, Special Structures – Composites.

5. Important notes:

In order to have partial grades rewritten, students should contact the instructor within the first two weeks of the semester.

The syllabus is valid from the winter semester of the 2025/2026 academic year, and its content is not subject to change during the semester.

Practical placement:

n/a

Element of course groups in various terms:

Course group description	First term	Last term
<i>missing group description in English (BudAB-S1-2019-sem8)</i>	2022/2023-L	

Course credits in various terms:

<without a specific program>			
Type of credits	Number	First term	Last term
European Credit Transfer System (ECTS)	2	2022/2023-L	