

## SYLLABUS

**Name:** Design and Testing of Masonry and Timber Structures (BudAB>SM2DEMTS19)

**Name in Polish:**

**Name in English:** Design and Testing of Masonry and Timber Structures

### Information on course:

**Course offered by department:** Faculty of Civil Engineering  
**Course for department:** Silesian University of Technology  
**Term:** Summer semester 2025/2026  
**Cordinator of course edition:** Prof. dr hab. inż. Jan Kubica

### Default type of course examination report:

EGZ

### Language:

English

### Course homepage:

<https://platforma.polsl.pl/rb/>

### Short description:

The subject of the course are broadly understood issues of the safety of brick and wooden structures. Issues related to the design and analysis of the construction of brick buildings located in seismic areas will be presented and discussed (based on the principles given in Eurocode 8). In terms of wooden structures, the issues related to the design of this type of building for exceptional loads, including fire, will be discussed.

### Description:

Advanced analyzes and calculations of brick and wooden structures (including new types of glued timber) will be presented. Problems with fire design of these structures in accordance with the provisions of the Eurocodes. With regard to masonry structures, the rules for calculating such structures and buildings will be analyzed in accordance with the rules given in Eurocode 8. The rules for protecting buildings against card house-collapse will be given. Additionally, the use of composite materials as reinforcement and protection material will be discussed. Recommendations and requirements for the use of FRP laminates to protect and increase the load-bearing capacity of masonry structural elements such as walls, beams and columns or to increase their resistance to cracking. Impact loads will be also analysed.

Advanced analysis and calculation of masonry and timber structures (including new types of glued timber). Problems with fire design of these structures according to Eurocodes regulations. Protection against card-house type of collapse. Using of composite materials as strengthening and protection material. Recommendations and requirements for using of FRP laminates in protection and enhancement of load-bearing capacity of masonry structural elements, like walls, beams and columns or for increasing their cracks' resistance.

The subject of the project is a multi-storey building with a brick wall load-bearing system and a new type of wooden ceiling and roof structures subjected to permanent and operational loads, wind and seismic loads. The computer analysis includes the Ultimate Limit States for constant and random design situations and the Serviceability Limit States (analysis of in-plane deformability of walls) for permanent or transient design situations for the most stressed parts of structural walls.

As part of the laboratory, students: make a literary understanding of a scientific or engineering problem; prepare the research program and technique; participate in research on a structural element and pre-process the obtained results.

### LECTURES -17h,

1. Advanced analysis and calculation of masonry and timber structures (including new types of glued timber).
2. Problems with fire design of these structures according to Eurocodes regulations.
3. Protection against card-house type of collapse.
4. Using of composite materials as strengthening and protection material.
5. Recommendations and requirements for using of FRP laminates in protection and enhancement of load-bearing capacity of masonry structural elements, like walls, beams and columns or for increasing their cracks' resistance.
6. The problems of impact loads.

### CLASSES - 3h,

Presentation and discussion of the design methodology for a masonry building with a wooden floor and roof structure subjected to wind and seismic dynamic loading.

### LABORATORY - 9h,

Students participate in the preparation and testing of large-scale test masonry elements or wooden structures or in tests of the strengthening such types of structures with usage of composite materials to such structures. The choice of laboratory research topics is determined by current research conducted in the Faculty of Civil Engineering laboratory.

### PROJECT - 11h,

1. Subject of the project is a few storey building with masonry wall load-bearing arrangement and new type of timber floor and roof structures subjected to dead and imposed loads, wind action and seismic action.
2. Computer analysis includes the Ultimate Limit States for permanent and accidental design situations and Serviceability Limit States for persistent or transient design situations of selected structural elements, as well as determination of equivalent mass forces from dynamic loads.

### Bibliography:

1. Hendry A.W., Sinha B.P., Davies S.R. Design of Masonry Structures. 3rd Edition E & FN SPON, UK, 1997.
2. Drysdale R.G., Hamid A.A. Masonry Structures. Behavior and Design. 3rd Edition TMS, Boulder, Colorado, 2008.
3. McKenzie W.M.C. Design of Structural masonry. Palgrave, UK, 2001.
4. Eurocode 5 (Part 1-1)
5. Eurocode 6 (all parts)
6. Eurocode 8 (Part 1 & Part 3)

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| <b>Learning outcomes:</b>                                                                                                                                                                                                                                                                                                     |
| <b>KNOWLEDGE:</b><br>Student knows:<br>- standards and guidelines for the design of selected general, industrial and communication constructions (effect K2A_W02);<br>- the principles of construction and sizing of complex building structures: steel, reinforced concrete, composite, timber and masonry (effect K2A_W03). |
| <b>SKILLS:</b><br>Student can:<br>- design details, selected elements and the whole object of complex metal, reinforced concrete, composite, timber and masonry construction (effect K2A_U03).                                                                                                                                |
| <b>Assessment methods and assessment criteria:</b>                                                                                                                                                                                                                                                                            |
| <b>PREREQUISITES:</b><br>Knowledge of advanced analysis and calculations connecting problems of advanced structural mechanics, masonry and timber structures.                                                                                                                                                                 |
| <b>COURSE PASS REQUIREMENTS:</b><br>1) attendance in class<br>2) regular consultation on the progress of work on the project and laboratory report;<br>3) presentation of the project also in the form of a multimedia presentation.                                                                                          |
| <b>FINAL GRADE:</b><br>60% Masonry + 40 % Timber<br>(The separate assessment from the masonry structures and wooden structures consists of 40% of the grade for the lecture test, 40% of the grade for the project and 20% of the grade for the laboratory).                                                                  |
| To have partial grades transferred, students should contact the instructor within the first two weeks of the semester                                                                                                                                                                                                         |
| The syllabus is effective from the summer semester of the 2025/2026 academic year, and its content is not subject to change during the semester                                                                                                                                                                               |

#### Information on course edition:

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| <b>Default type of course examination report:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| EGZ                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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#### Details of classes and study groups

|                                     |
|-------------------------------------|
| lecture (17 hours)                  |
| <b>Study groups details</b>         |
| <i>missing study groups details</i> |
| classes (3 hours)                   |
| <b>Study groups details</b>         |
| <i>missing study groups details</i> |
| laboratory classes (9 hours)        |
| <b>Study groups details</b>         |
| <i>missing study groups details</i> |
| project (11 hours)                  |
| <b>Study groups details</b>         |
| <i>missing study groups details</i> |

#### Element of course groups in various terms:

| Course group description                                         | First term  | Last term |
|------------------------------------------------------------------|-------------|-----------|
| <i>missing group description in English</i> (BudAB-S2-2019-sem2) | 2020/2021-L |           |

**Course credits in various terms:**

**<without a specific program>**

| Type of credits                        | Number | First term  | Last term |
|----------------------------------------|--------|-------------|-----------|
| European Credit Transfer System (ECTS) | 4      | 2020/2021-Z |           |