Timber & Masonry Structures

Code: MK3TAR8S4SB17-EN

ECTS Credit Points: 4

Evaluation: mid-semester grade

Year, Semester: 4th year, 1st semester

Its prerequisite(s): Construction Materials, Theory of Design & Approximate Calculations

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 4+0

Topics:

The subject consists of two main parts.

Topics of the Timber part

The structure of wood (macro- and microscopic properties). Wood preservations (fungies, insects, mositure, storage). Roof constructions and ceiling structures (traditional and modern structures). Timber design with EC 5 (basics - compressing, tension, bending). Timber connections (traditional- and designed connections with EC 5).

Topics of the Masonry part

Since the majority of the major masonry structures in Europe are historic structures, in the masonry part of the subject we discuss them with the following main topics:

Evolution of the masonry structural components. History of the structural engineering. Structural engineering of masonry architecture. Materials of masonry structures: stone, brick. Case studies.

As a practice, every student has to hold a 15-minute presentation about a significant masonry building of her/his homeland, and we discuss it with the other students. The main aspects of the presentations: introduction of the building (with map, photos and drawings), the history of the building with special emphasis on its construction, the structural components of the building and their structural behaviour, the building material used and its general characteristic, the general state of the load-bearing masonry structures of the building with special emphasis on the possible failures, suggestion to fix the failures (if there are any), bibliography (including internet sources).

Literature:

Compulsory:

- Jacques Heyman, The Stone Skeleton. Structural Engineering of Masonry Architecture, Cambridge University Press, 1997, ISBN 978-0-521-62963-8
- Nikolaus Pevsner, An Outline of European Architecture, J. Murray, 1948
- Forest Products Laboratory. 2010. Wood handbook—Wood as an engineering material. General Technical Report FPL-GTR-190. Madison, WI: U.S. Department of Agriculture, Forest Service, Forest Products Laboratory. 508 p.
- Jack Porteous and Abdy Kerimani, Structural Timber design. Blackwell Science Ltd, 2007, ISBN 978-14051-4638-8
- EN 1995-1-1: Eurocode 5: Design of timber structures- Part 1-1: General- Common rules and rules for buildings

Recommended:

- Wieland Ramm, Design of Masonry Structures According Eurocode 6, Online Resource
- Santiago Huerta, Wedges and plate-bandes: mechanical theories after De la Hire, presses polytechniques et universitaires romandes, 2012, ISBN 978-2-88074-893-7
- Jim Coulson, Wood in Construction. John Wiley & Sons 2012, ISBN13 978-0-47065-777-5
- Hoadley, r. Bruce; Understanding Wood - A craftsman's Guide to Wood Technology, Taunt Press 2000, ISBN13 978-1-561-58358-4

Schedule

1st week Registration week

2nd week:	3rd week:
Lecture: History and evolution of the masonry structures, part 1.	Lecture: History and evolution of the masonry structures, part 2.
Case study: the reconstruction of the masonry vault of the Avas church, Miskolc	Case study: the structural analysis of the (demolished) medieval system of St. Elisabeth's church in Kassa
4th week:	5th week:
Lecture: Evolution of the engineering, the classical theory of the masonry arch	Lecture: Masonry walls and domes
Case studies: the operation of the Wiener Bauhütte, the reconstruction of the towers of the Wiesenkirche, Soest	Student presentations
6th week:	7th week:
Lecture: The masonry vault	Lecture: Materials: brick and stone
Student presentations	Test
8th week: 1st drawing week	
9th week:	10th week:
Lecture: Macro- and Microscopic structures of the wood	Lecture: Moisture relations and physical properties of wood
11th week:	12th week:
Lecture: Wood preservations (fungus, insects, moisture relations, storage)	Lecture: Roof constructions and ceiling structures
13th week:	14th week:
Lecture: Timber design with EC 5 (basics - compressing, tension, bending)	Lecture: Timber conections (traditional- and designed connections with EC 5)
15th week: 2nd drawing week	

Requirements

Participation at lectures is compulsory. Students must attend lectures and may not miss more than three lectures during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. The staff of the department will record the attendance at lectures. In case of further absences, a medical certificate needs to be presented.

For a signature and a grade: every student has to fulfill the minimal requirements both in the Timber and the Masonry part.

The requirements of the Masonry part are the following:

For a signature: every student has to hold a 15-minute presentation about a significant masonry building of her/his homeland, discussing each of the following aspects: introduction of the building (with map, photos and drawings), the history of the building with special emphasis on its construction, the structural components of the building and their structural behavior, the building material used and its general characteristic, the general state of the load-bearing masonry structures of the building with special emphasis on the possible failures, suggestion to fix the failures (if there are any), bibliography (including internet sources)

For a grade: every student has to submit a successful test. The test consists of two parts: the first part is a construction of a thrust line of a masonry arch and some related questions; the second part contains theoretical questions. For a minimum (2) pass grade at least the thrust line construction must be fulfilled. For a maximum (5) grade every related question and every theoretical question has to be answered.

The requirements of the Timber part are the following.

For a signature: every student has to do a task until the end of the semester. This task includes some drawing, calculation parts. At the end they will get points on every parts of the task.

Submitted and accepted semester design task requirement is at least 61 points.

Parts and possible points of the task:

Points	max.
• draw the structural layout	20p
• draw at least 2 sections	20p
• timber volumen calculate	20p
• calculate the loads	20p
• design one timber element	20p
summa:	100p

For a grade: successful test about the Timber part

Possible results of Timber test:

Score		Grade	
0 – 60	points:	fail	(no sign)
61 – 70	points:	pass	(2)
71 – 80	points:	satisfactory	(3)
81 – 90	points:	good	(4)
91 – 100	points:	excellent	(5)

The final grade is the average of the grades of the Timber and the Masonry parts.