Timber Structures - BMEEOHSAS44 - 2024/25/2

I. Tantárgyleírás

1. Alapadatok

1.1 Tantárgy neve

TIMBER STRUCTURES

1.2 Azonosító (tantárgykód)

BMEEOHSAS44

1.3 Tantárgy jellege

Kontaktórás tanegység

1.4 Óraszámok

Típus	Óraszám / (nap)
Előadás (elmélet)	2

1.5 Tanulmányi teljesítményértékelés (minőségi értékelés) típusa

Félévközi érdemjegy

1.6 Kreditszám

3

1.7 Tárgyfelelős

név	Dr. Koris Kálmán
beosztás	Adjunktus
email	koris.kalman@emk.bme.hu

1.8 Tantárgyat gondozó oktatási szervezeti egység

Hidak és Szerkezetek Tanszék

1.9 A tantárgy weblapja

https://epito.bme.hu/BMEEOHSAS44
https://edu.epito.bme.hu/course/view.php?id=446

1.10 Az oktatás nyelve

magyar és angol

1.11 Tantárgy típusa

Kötelező az építőmérnöki (BSc) szakon

1.12 Előkövetelmények

Strong prerequisites:

- Introduction to Strength of Materials (BMEEOTMAT42)
- Basis of Design (BMEEOHSAT41)

1.13 Tantárgyleírás érvényessége

2020. február 5.

2. Célkitűzések és tanulási eredmények

2.1 Célkitűzések

The aim of this course is to introduce the materials, types, strengths and design methods of timber structures to the students. Within the scope of the subject the following topics are introduced: material models and strength grades of timber material, design of timber structural members for ULS according to EC5 (compression, tension, bending, shear, torsion, combined actions, stability analysis), design of timber structural members for SLS according to EC5 (deformations, durability, fire resistance), design of single and multiple shear plane connections with metal dowel-type fasteners (nailed and bolted connections), punched metal plate fasteners, split ring connectors and toothed plate connectors, bonded connections, design of glued-laminated timber structures, configuration and design of roof structures and lattice girders, analysis of stress concentration sites in timber structures and constructive protection methods. Improved understanding and deepening of knowledge is supported by the presentation and comparative analysis of existing timber structures.

2.2 Tanulási eredmények

A tantárgy sikeres teljesítése utána a hallgató

A. Tudás

1. Knows the materials, material models and material properties of timber structures, the effects that affect the material properties, strength grades of timber material according to EC5, as well as the theoretical and practical methods for the determination of characteristic strength,
2. knows the dimensioning principles of timber structures in ULS and SLS for simple and combined actions as well as how to perform stability analyses,
3. knows the behaviour and design principles of glued-laminated structures,
4. knows the failure mechanism of dowel-type and complex mechanical connections, the typical configuration and design methods of different connection types,
5. knows the configuration principles of modern roofs and lattice girders, as well as the most important aspects and principles of the strength analysis of these structures,
6. knows the typical stress concentration sites in timber structures, and the most important constructive timber protection methods,
7. knows the principles of fire design in case of timber structures.

B. Képesség

1. The student is able to determine the design strength and stiffness properties of timber structures in function of the load, the environmental conditions and the size of the structural element,
2. the student is able to verify the strength, stability and deflection of timber structural members subjected to simple or combined actions,
3. the student is able verify the strength, stability and deflection of different glued-laminated girders,
4. the student is able to verify the load bearing capacity of a dowel-type or complex mechanical connection, as well as to design the connection considering the appropriate detailing rules,
5. the student is able to model and verify a timber lattice girder or roof structure,
6. the student is able to detect potential stress concentration sites, and improve the structure by applying an appropriate structural or connection configuration, He is able to consider the most important aspects of constructive protection methods during the design procedure,
7. the student is able to verify the strength of a timber structural member or connection in case of fire event.

C. Attitűd

1. The student is open to the application and design of modern timber materials, girder types, connections and dimensioning methods,
2. the student makes an effort to accurate and error-free task solving,
3. the student seeks to enforce the principle of energy efficiency and environmental awareness in the design of timber structures.

D. Önállóság és felelősség

1. Independently performs the task of thinking and solving tasks and problems related to the dimensioning of timber structures,
2. uses the systemic approach in its thinking.

2.3 Oktatási módszertan

Presentations, exercise classes, written and oral communication, use of IT tools and techniques, independent task solving, work organization techniques.

2.4 Részletes tárgyprogram

Week	Topics of lectures and/or exercise classes
1.	Materials and material models of timber structures. The derivation of material properties, the effect of the individual factors on the strength.
2.	The strength grades of the timber structures (MSZ EN 338, MSZ EN 14080), theoretical and experimental methods for determining the characteristic strength.
3.	Requirements for modern timber structures in ultimate and serviceability limit states.
4.	Analysis of timber structures for combined actions, stability analyses (buckling, lateral torsional buckling).
5.	Strength analysis of bonded connections, structural configuration and technological requirements. Dimensioning of glued-laminated timber girders - 1.
6.	Strength analysis of bonded connections, structural configuration and technological requirements. Dimensioning of glued-laminated timber girders - 2.
7.	Typical failure mechanism and design of dowel-type connections (bolted, nailed), detailing rules for dowel-type connections.
8.	Typical configuration and design of complex mechanical connections (split ring connectors, toothed plate connectors, punched metal plate fasteners) - 1.
9.	Typical configuration and design of complex mechanical connections (split ring connectors, toothed plate connectors, punched metal plate fasteners) - 2.
10.	Configuration and design of modern roof structures and lattice girders.
11.	Modelling of fire effect for structural design. Design of timber structures in case of a fire event.
12.	Stress concentration sites in timber structures and their analysis - 1.
13.	Stress concentration sites in timber structures and their analysis - 2.
14.	Comparative analysis of existing timber structures.

A félév közbeni munkaszüneti napok miatt a program csak tájékoztató jellegű, a pontos időpontokat a tárgy honlapján elérhető "Részletes féléves ütemterv" tartalmazza.

2.5 Tanulástámogató anyagok

a) Textbooks:

1. J. Porteous, A. Kermani: *Structural timber design to Eurocode 5*. Blackwell Publishing Ltd, 2007. (recommended)

b) Online materials:

1. Introduction to the design of timber structures, Electronic Lecture Note.
2. Material properties of timber structures, Electronic Lecture Note.
3. Verification of timber structures in ULS and SLS, Electronic Lecture Note.

4. Verification of timber structures for combined actions and stability analyses, Electronic Lecture Note.
5. Design of glued-laminated structures, Electronic Lecture Note.
6. Dowel-type connections I., Electronic Lecture Note.
7. Dowel-type connections II., split ring and toothed plate connections I., Electronic Lecture Note.
8. Split ring and toothed plate connections II., nail plate connections, Electronic Lecture Note.
9. Timber roofs and lattice girders, Electronic Lecture Note.
10. Fire design of timber structures, Electronic Lecture Note.

2.6 Egyéb tudnivalók

2.7 Konzultációs lehetőségek

The instructors are available for consultation during their office hours, as advertised on the department website.

Jelen TAD az alábbi félévre érvényes:

II. Tárgykövetelmények

3. A tanulmányi teljesítmény ellenőrzése és értékelése

3.1 Általános szabályok

The assessment of the learning outcomes specified in clause 2.2. above and the evaluation of student performance occurs via three tests.

3.2 Teljesítményértékelési módszerek

Evaluation form	Abbreviation	Assessed learning outcomes
1. midterm test	ZH1	A.1-A.2; B.1-B.2; C.1-C.3; D.1-D.2
2. midterm test	ZH2	A.3-A.4; B.3-B.4; C.1-C.3; D.1-D.2
3. midterm test	ZH3	A.5-A.7; B.5-B.7; C.1-C.3; D.1-D.2

A szorgalmi időszakban tartott értékelések pontos idejét, a házi feladatok ki- és beadási határidejét a "Részletes féléves ütemterv" tartalmazza, mely elérhető a tárgy honlapján.

3.3 Teljesítményértékelések részaránya a minősítésben

Abbreviation	Score
ZH1	50%
ZH2	50%
ZH3	50%
Total achievable during the semester	100%
Sum	**100%**

The test is not successful if the average of two better tests is less than 50% of the available points (15 points).

3.4 Az aláírás megszerzésének feltétele, az aláírás érvényessége

No signature can be obtained from the subject.

3.5 Érdemjegy megállapítása

The final grade is determined according to the following criteria:

The final grade is calculated from the weighted average of the two better tests according to clause 3.3. Maximum 30 points can be obtained on each test. Extra points can be gained by the successful completion (≥50%) of the third (weakest) test. Extra points are calculated as 20% of the weakest (but successful) test (max. 6 points). The final grade based on the points:

Grade	Points (P)
excellent (5)	26 p ≤ P
good (4)	22 p ≤ P ≤ 25.99 p
satisfactory (3)	18 p ≤ P ≤ 21.99 p
passed (2)	15 p ≤ P ≤ 17.99 p
failed (1)	P < 15 p

3.6 Javítás és pótlás

There is no minimum requirement for individual mid-term benchmarking, therefore individual retake of the tests is not possible.

3.7 A tantárgy elvégzéséhez szükséges tanulmányi munka

Activity	Hours/semester
contact hours	14×2=28
preparation for the tests	3×16=48
home studying of the written material	14×1=14
Sum	**90**

3.8 A tárgykövetelmények érvényessége

2020. február 5.

Jelen TAD az alábbi félévre érvényes: