Steel Structures - BMEEOHSAT42

I. Subject Specification

1. Basic Data

1.1 Title

Steel Structures

1.2 Code

BMEEOHSAT42

1.3 Type

Module with associated contact hours

1.4 Contact hours

Type	Hours/week / (days)
Lecture	3

1.5 Evaluation

Midterm grade

1.6 Credits

3

1.7 Coordinator

name	Dr. Kövesdi Balázs Géza (fall semester), Dr. Kovács Nauzika (spring semester)
academic rank	Associate professor
email	kovesdi.balazs@emk.bme.hu

1.8 Department

Department of Structural Engineering

1.9 Website

https://epito.bme.hu/BMEEOHSAT42
https://fiek2.mywire.org/course/view.php?id=449

1.10 Language of instruction

hungarian and english

1.11 Curriculum requirements

Compulsory in the Civil Engineering (BSc) programme

1.12 Prerequisites

Strong prerequisites:

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

Weak prerequisites:

- Construction Materials I. (BMEEOEMAT43)

1.13 Effective date

5 February 2020

2. Objectives and learning outcomes

2.1 Objectives

Lectures of Steel Structures have the general aim to study the basics of the design of steel structures, which consists of the design of simple structural members, simple joints and the investigation of the basic failure phenomenon, which can occur in steel structures. The students get knowledge in the following topics: steel grades, mechanical properties of the steel material; calculation of cross-sectional properties; design of centrically loaded tension members; design of centrically loaded compression members; buckling problem – behaviour – design method; design of beams: construction, behaviour under bending and shear interaction; beam structural behaviour - design approaches for lateral torsional buckling; design of bolted connections; design of welded connections; fatigue design and brittle fracture; plate buckling phenomena, basics of the cross-section classification.

2.2 Learning outcomes

Upon successful completion of this subject, the student:

A. Knowledge

1. knows the limit states used for design of steel structures,
2. knows the design method of centrically loaded tension members,
3. knows the design method of centrically loaded compression members,
4. knows the design method of restrained beam members loaded by bending and shear,
5. knows the design method used for lateral torsional buckling,
6. knows the design basics of bolted joints,
7. knows the design basics of welded joints,
8. knows the buckling phenomena and the basics of the cross-section classification.

B. Skills

1. can design a centrically loaded tension member,
2. can calculate the buckling resistance of centrically loaded compression member,
3. can perform the cross-section check of beam elements,
4. can calculate the lateral torsional buckling resistance of beams,
5. can calculate the resistance of bolted joints,
6. can calculate the resistance of welded joints,

C. Attitudes

1. is ready to learn advanced new design methods,
2. is intent on learning and applying the relevant tools of steel structural design,
3. is intent on precise and error-free problem solving,

D. Autonomy and Responsibility

1. is able to autonomously evaluate the design problems of steel structures and able to autonomously complete design calculations based on the literature.

2.3 Methods

Lectures, large hall calculation examples, communication in written and oral form, application of IT devices and techniques.

2.4 Course outline

Week	Topics of lectures and/or exercise classes
1.	Introduction. Steel, as a structural material; mechanical properties; notations; steel production.
2.	Centrically loaded tension members. Structural layout – behaviour – design method.
3.	Centrically loaded compression members. Buckling problem: Structural layout – behaviour – design method.
4.	Centrically loaded compression members. Buckling length determination.
5.	Beams: construction, behaviour under bending and shear and M-V interaction. Behaviour - design approaches.
6.	Beams: Lateral torsional buckling. Behaviour – design approaches, general and simplified design methods.
7.	Design philosophy of beam members – examples.
8.	Design and layout of steel joints; construction aspects of welded and bolted joints and their application fields.
9.	Design of welded connections: structural layouts, structural behaviour, limit states, design approaches.
10.	Design of welded connections / design approaches / examples.
11.	Design of bolted connections: structural layouts, structural behaviour, limit states, design approaches.
12.	Design of bolted connections / design approaches / examples.
13.	Plate buckling phenomena, design methods.
14.	Basics of the cross section classification; conceptional design of steel structures / case studies.

The above programme is tentative and subject to changes due to calendar variations and other reasons specific to the actual semester. Consult the effective detailed course schedule of the course on the subject website.

2.5 Study materials

a) Textbooks
1. Halász, Platthy: Acélszerkezetek.
b) Online materials
1. Lecture notes

2. Examples for practical design of steel structures

2.6 Other information

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2.7 Consultation

The instructors are available for consultation during their office hours, as advertised on the department website. Special appointments can be requested via e-mail: kovesdi.balazs@emk.bme.hu (fall semester) and kovacs.nauzika@emk.bme.hu (spring semester).

This Subject Datasheet is valid for:

2023/2024 semester I

II. Subject requirements

Assessment and evaluation of the learning outcomes

3.1 General rules

The assessment of the learning outcomes specified in clause 2.2. above and the evaluation of student performance occurs via midterm tests, home works and attendance on the lectures.

3.2 Assessment methods

Evaluation form	Abbreviation	Assessed learning outcomes
1. midterm exam (summary evaluation)	MT1	A.1-A.3; B.1-B.2; C.1-C.3; D.1
2. midterm exam (summary evaluation)	MT2	A.4-A.5; B.3-B.4; C.1-C.3; D.1
3. midterm exam (summary evaluation)	MT3	A.6-A.8; B.5-B.6; C.1-C.3; D.1
1-3 home work	HW	A.1-A.8; B.1-B.6; C.1-C.3; D.1
attendance and activity (optional; positive only)	A	A.1-A.8; B.1-B.6

The dates of deadlines of assignments/homework can be found in the detailed course schedule on the subject's website.

3.3 Evaluation system

Abbreviation	Score
MT1	34%
MT2	34%
MT3	34%
HW1	5%
HW2	5%
HW3	5%
A (bonus)	17%
Sum	**100%**

Midterm exams:

- All midterm exams have theoretical and practical parts.
- Two midterm exams should be completed ≥ 50% among the three midterms, theoretical and practical part separately.
- The best two theoretical and practical parts are not necessarily from the same midterms (e.g. MT1 and 3 theories and MT2 and 3 practices are the two bests).

Home works:

- Home works are optional.
- The aim of the home works are the preparation for hte practical part of the midterms. They are parametric practical examples, unique for each students.
- Max. 15 points are gained by Home works.

Bonus points:

- By completing the third midterm (less gained points) successfully (≥50%) bonus points are gathered.
- The theoretical and practical parts of the third midterm (less gained points) max 7 and 10 points are

gathered.

3.4 Requirements and validity of signature

No signature can be achieved.

3.5 Grading system

Student fullfilled the attendance requirements, and completed the two midterm exams with results ≥ 50%, the semester grade is calculated by as follows:

Achiavble max. points:

Abbreviation	**Max points**
Mt best:	34 point (theory:14 point + practice: 20 point)
Mt second best:	34 point (theory:14 point + practice: 20 point)
Home works:	15 point
Bonus:	17 points
Sum:	**100 point**

The grade of the semester based on the gained points:

Grade	**Points (P)**
excellent (5)	85<=P
good (4)	75<=P<85
satisfactory (3)	65<=P<75
passed (2)	50<=P<65
failed (1)	P<50

3.6 Retake and repeat

1. No repetition or retake of the Midterm exams are available.
2. No repetition or retake of the Home works are available.

3.7 Estimated workload

Activity	**Hours/semester**
contact hours	14×3=42
preparation for the tests , home works	2×16=32
home studying of the written material	16
Sum	**90**

3.8 Effective date

21 February 2023

This Subject Datasheet is valid for:

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2023/2024 semester I