SUBJECT DATASHEET

I. SUBJECT SPECIFICATION

1 BASIC DATA

1.1 Title

STRUCTURES 1

1.2 Code

BMEEOHSMS51

1.3 Type

Module with associated contact hours

1.4 Contact hours

type	hours/week
lectures	4/week
seminars/exercise classes	0/week

1.5 Evaluation

examination

1.6 Credits

5

1.7 Coordinator

name:	Kollár László
academic rank:	full professor
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1.8 Department

Department of Structural Engineering (http://www.epito.bme.hu/hidak-es-szerkezetek-tanszek)

1.9 Website

http://www.epito.bme.hu/BMEEOHSMS51

1.10 Language of instruction

Hungarian and English

1.11 Curriculum requirements

Compulsory in the Structural engineering (MSc) programme

1.12 Prerequisites

No prerequisites.

1.13 Effective date

September 1, 2017.

2 OBJECTIVES AND LEARNING OUTCOMES

2.1 Objectives

The objective of the subject is the modelling of beams, membrans, plates and the simplest circular shell structures. The most important analytical solutions, the basics and assumptions of numerical solutions are introduced. It's presented that the different structural considerations can be implemented in the design codes and regulations. The fundamental membrane solutions, shear lag effect, effective width, shear deformation, second-order effects and large deformations, anisotropy and the vibration of floors are also analysed. The main focus of the subject is the analysis of plates and slabs.

2.2 Learning outcomes

Upon successful completion of this subject, the student:

A. Knowledge
   1. will learn the methods of structural design and calculation,
   2. will learn the behaviour and design of membrane-type structures,
   3. will learn the boundaries of numerical calculations,
   4. will learn the typical behaviour of rods,
   5. will learn the calculation methods of the internal forces and displacements of plate structures,
   6. will learn the behaviour and design steps of plates,
   7. will learn the behaviour of cylindrical shells and circular membranes loaded with circularly symmetric loads.

B. Skills
   1. will be able to calculate discs, beams and plates,
   2. will be able to determine the shear deformation and take into consideration the second order effects,
   3. will be able to design plates, take into account the second order effects,
   4. will be able to calculate the vibration of floors, also in case of slabs supported by beams,
   5. will be able to analyse of cylindrical shells and circular membranes loaded with circularly symmetric loads.

C. Attitudes
   1. cooperates with the lecturer and with fellow students,
   2. is ready to apply numerical computational tools,
   3. is intent on understanding the behaviour of structures,
   4. is intent on precise and error-free problem solving,
   5. is attending to the classes as a responsible member of the community.

D. Autonomy and responsibility
   1. is open to the new information,
   2. is able to think in system.

2.3 Methods

Lectures, exercises, written and oral communications, application of IT tools and techniques, assignments solved individually.

2.4 Course outline

week:	Topics of lectures and/or exercise classes
1-3.	Modelling, stresses and strains in 2D, material laws, anisotropy, basic equations of elasticity, discs, holes in discs, stress in the knee of frames, Boussinesq solution, brazil-test, shear lag and its application, theory of effective width.

4-6. Basic equations of beams, bending, twisting, shearing, Timoshenko-beam, significance of shear/torque in beams with solid and thin-walled cross section, second order effects and their application in design codes, large deflection of beams.

7-11. Basic equations of plates, boundary conditions (Kirchhoff plate), behaviour of plates, reinforced concrete plates, anisotropy plates, large deflection of plates, vibration of floors, explanation of the limits applied in design codes, vibration of floors supported by beams and its approximation with the help of the displacements, summation theory of Föppl, Southwell and Dunkerly, vibration of ribbed floors, effect of the shear on the vibration (ex. timber-concrete slab), effect of normal force on the vibration, modal analysis of slabs and its comparison with the modal analysis of earthquake design, ponding, slabs with continuous elastic support, plastic design.

12-14. Bending of cylindrical shells in case of circularly symmetric loads, membrane state of cylindrical shells.

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

Kollár L. P., Tarján G.: Tartószerkezetek elmélete és számítása, 2015

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.

II. SUBJECT REQUIREMENTS

3 ASSESSEMENT 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 tests and the examination.

3.2 Assessment methods

Evaluation form	abbrev.	**assessed learning outcomes**
1. midterm test	ZH1	B.1-B.2
2. midterm test	ZH2	B.3-B.4
3. midterm test	ZH3	B.5.
1.-3. Homework	HW1-HW3	B.1-B.5; C.1-C.4.
written examination	V	A.1-A.7, B.1-B.5; C.1-C.5; D.1-D.2

The dates of midterm tests can be found in the detailed course schedule on the subject's website.

3.3 Evaluation system

abbreviation	**score**
ZH1-ZH3	30%
HW1-HW3	9%
Total achievable during the semester	**39%**
V	61%
Sum	**100%**

The midterm tests are unsatisfactory if the average points of the two best tests is less than 50% of the achievable points.

Obtaining less than 40% of the achievable points on the exam, or reaching less than 50% of the total points will lead to a final mark 'failed' (1).

3.4 Requirements and validity of signature

Criterion for the signature is to successfully fulfil the criteria of the midterm exams detailed in point 3.3 and the student obtains at least 50% of the total achievable points during the semester. No points are given for the homework submitted after the deadline (homework submission is not compulsory).

If the applicant does not take the examination course with an earlier acquired signature, his or her points are overwritten by his or her new points.

The previously acquired point can be taken into account in the next 6 semesters.

3.5 Grading system

If the student satisfies the attendance criteria, his/her mark will be determined as follows.

The obtained mid-semester points are evaluated by the results of the mid-tem tests and the homework. The final mark is calculated on the basis of the weighted average of the semester results and the Exam (with the weights shown in the table of Section 3.3), as shown in the following table:

grade	points (P)
excellent (5)	80<=P
good (4)	70<=P<80%
satisfactory (3)	60<=P<70%
passed (2)	50<=P<60%
failed (1)	P<50%

3.6 Retake and repeat

1) There is no repetition of the midterm tests.

3.7 Estimated workload

activity	hours/semester
contact hours	14×4=56
preparation for the courses	14×1=14
preparation for the tests	3×6=18
Preparing the homework	3x10=30
preparation for the examination	32
in total	**150**

3.8 Effective date

September 1, 2017.