# SUBJECT DATASHEET

## I. SUBJECT SPECIFICATION

### 1 BASIC DATA

#### 1.1 Title

**RC AND MASONRY STRUCTURES**

#### 1.2 Code

**BMEEOHSAS42**

#### 1.3 Type

Module with associated contact hours

#### 1.4 Contact hours

<table>
<thead>
<tr>
<th>type</th>
<th>hours/week</th>
</tr>
</thead>
<tbody>
<tr>
<td>lectures</td>
<td>2</td>
</tr>
<tr>
<td>seminars/exercise classes</td>
<td>1</td>
</tr>
</tbody>
</table>

#### 1.5 Evaluation

midterm grade

#### 1.6 Credits

4

#### 1.7 Coordinator

| name:                  | Dr. Koris Kálmán |
| academic rank:         | assistant professor |
| email:                 | koris.kalman@mail.bme.hu |

#### 1.8 Department

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

#### 1.9 Website

[www.epito.bme.hu/BMEEOHSAS42](http://www.epito.bme.hu/BMEEOHSAS42)

#### 1.10 Language of instruction

Hungarian and English

#### 1.11 Curriculum requirements

Compulsory in the Structural engineering programme (BSc)

#### 1.12 Prerequisites

Required previous subjects (need to be completed to register)
- Reinforced Concrete Structures (BMEEOHSAT43)

Subjects from which previous midterm signature are required to register
- Building Construction I. (BMEEOEMAS42)
- Structural Analysis I. (BMEEOTMAT43)

#### 1.13 Effective date

September 1, 2017.
2 OBJECTIVES AND LEARNING OUTCOMES

2.1 Objectives
The aim of the course to let the students master the principles, design methods and the typical structural design of different reinforced concrete and masonry structures. Within the scope of the subject, frame and slab structures, bracing systems of reinforced concrete buildings, various reinforced concrete structural details (beam end, corbel, frame corner, curved axis beam, stairs, force transfer, expansion joints, etc.), as well as load-bearing non-reinforced and reinforced masonry walls are discussed.

2.2 Learning outcomes
Upon successful completion of this subject, the student:
A. Knowledge
   1. Knows the modelling possibilities of reinforced concrete frames, the approximate and accurate calculation methods of internal forces, and the effects to be taken into account in the calculation,
   2. knows the approximate stability checking methods of buildings, the possible configurations of bracing systems, the principle of calculating statically determinate bracing systems, and the principles of column and wall design and reinforcing,
   3. knows the typical internal forces and their distribution in RC slabs, the available approximate methods for the calculation of internal forces in case of different slab and load types, the internal force distribution around openings, as well as the principles of punching shear analysis in case of flat slabs and the design of RC slabs,
   4. knows the basic principles of plasticity theory, and the theoretical principles of plastic slab design,
   5. knows the configuration, force distribution and material properties of non-reinforced and reinforced masonry walls, as well as the dimensioning principles of non-reinforced masonry walls,
   6. knows the internal force distribution and the design principles of RC beam ends, force introduction zones, corbels and columns with helical reinforcement.

B. Skills
   1. The student is able to approximately and exactly determine the internal forces and deformations of RC frames, to approximately verify the stability of frames, and to determine the necessary reinforcement of RC columns and walls,
   2. the student is able to determine the forces acting to walls of a statically determinate bracing system,
   3. the student is able to approximately and exactly determine the internal forces and deformations of different RC slabs, to determine the necessary reinforcement of slabs and to verify the punching shear resistance of flat slabs,
   4. the student is able to determine the plastic load bearing capacity (collapse load) of simple slabs,
   5. the student is able to verify the load bearing capacity of non-reinforced masonry walls subjected to eccentric compression or shear,
   6. the student is able to determine the forces acting to walls of a statically indeterminate bracing system.

C. Attitudes
   1. The student cooperates with the lecturer,
   2. the student is open to the use of IT tools,
   3. the student makes an effort to get to know and use the tools needed for the dimensioning of RC frame and plate structures, as well as masonry walls,
   4. the student makes an effort to accurate and error-free task solving,
   5. the student seeks to enforce the principle of energy efficiency and environmental awareness in the design of reinforced concrete and masonry structures.

D. Autonomy and responsibility
   1. Independently performs the task of thinking and solving tasks and problems related to the dimensioning of RC and masonry structures,
   2. welcomes the well-founded critical remarks,
   3. uses the systemic approach in its thinking,
2.3 Methods

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

2.4 Course outline

week: Topics of lectures and/or exercise classes


9-10. Configuration, materials and dimensioning of non-reinforced and reinforced masonry walls. Verification of masonry walls subjected to eccentric compression and shear.

11-13. RC structural details: corbel, strut and tie model, introduction of forces, local compression, helical reinforcement.


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. György Deák, András Draskóczy, Endre Dulácska, László Kollár, György Visnovitz: Reinforced Concrete Design Aids, Dept. of Mechanics, Materials and Structures, Faculty of Architecture, 2011. (compulsory)


b) Online materials

2. Reinforcement of concrete frames, Electronic Lecture Note.
5. Punching shear design of flat concrete slabs, Electronic Lecture Note.
6. Basis of the design of masonry structures according to EC, Electronic Lecture Note.
7. Masonry structures design aid to be used on the Test, Electronic Lecture Note.
The instructors are available for consultation during their office hours, as advertised on the department website. Special appointments can be requested via e-mail: koris.kalman@mail.bme.hu
II. SUBJECT REQUIREMENTS

3 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 three tests and three homework.

3.2 Assessment methods

<table>
<thead>
<tr>
<th>Evaluation form</th>
<th>abbrev.</th>
<th>assessed learning outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. midterm test</td>
<td>ZH1</td>
<td>A.1-A.2; B.1-B.2; C.4; D.1</td>
</tr>
<tr>
<td>2. midterm test</td>
<td>ZH2</td>
<td>A.3-A.4; B.3-B.4; C.4; D.1</td>
</tr>
<tr>
<td>3. midterm test</td>
<td>ZH3</td>
<td>A.3; A.5-A.6; B3; B.5-B.6; C.4; D.1</td>
</tr>
<tr>
<td>1. homework</td>
<td>HF1</td>
<td>A.1-A.2; B.1-B.2; C.1-C.5; D.1-D.3</td>
</tr>
<tr>
<td>2. homework</td>
<td>HF2</td>
<td>A.3-A.4; B.3-B.4; C.1-C.5; D.1-D.3</td>
</tr>
<tr>
<td>3. homework</td>
<td>HF3</td>
<td>A.3; A.5-A.6; B3; B.5-B.6; C.1-C.5; D.1-D.3</td>
</tr>
</tbody>
</table>

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

3.3 Evaluation system

<table>
<thead>
<tr>
<th>abbreviation</th>
<th>score</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZH1</td>
<td>41%</td>
</tr>
<tr>
<td>ZH2</td>
<td>41%</td>
</tr>
<tr>
<td>ZH3</td>
<td>41%</td>
</tr>
<tr>
<td>HF1</td>
<td>6%</td>
</tr>
<tr>
<td>HF2</td>
<td>6%</td>
</tr>
<tr>
<td>HF3</td>
<td>6%</td>
</tr>
<tr>
<td>Total achievable during the semester</td>
<td>100%</td>
</tr>
<tr>
<td>Sum</td>
<td>100%</td>
</tr>
</tbody>
</table>

The test is not successful if the average of two better tests is less than 50% of the available points (41 points), or if the average of two better results of theoretical part of the tests is less than 40% of the points available with the theoretical part.

3.4 Requirements and validity of signature
No signature can be obtained from the subject.

3.5 Grading system
The final grade is determined according to the following criteria:

The final grade is calculated from the weighted average of the two better tests and the 3 homework according to clause 3.3.

Maximum 82 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 10% of the weakest (but successful) test (max. 8 points). The three homework submitted for the deadline are worth 6 points each (max. 18 points). The final grade based on the points:
<table>
<thead>
<tr>
<th>grade</th>
<th>points (P)</th>
</tr>
</thead>
<tbody>
<tr>
<td>excellent (5)</td>
<td>90&lt;=P</td>
</tr>
<tr>
<td>good (4)</td>
<td>75&lt;=P&lt;90%</td>
</tr>
<tr>
<td>satisfactory (3)</td>
<td>60&lt;=P&lt;75%</td>
</tr>
<tr>
<td>passed (2)</td>
<td>45&lt;=P&lt;60%</td>
</tr>
<tr>
<td>failed (1)</td>
<td>P&lt;45%</td>
</tr>
</tbody>
</table>

3.6 Retake and repeat

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

3.7 Estimated workload

<table>
<thead>
<tr>
<th>activity</th>
<th>hours/semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>contact hours</td>
<td>14×3=42</td>
</tr>
<tr>
<td>preparation for the tests</td>
<td>14+14+14=20</td>
</tr>
<tr>
<td>homework</td>
<td>36</td>
</tr>
<tr>
<td><strong>in total</strong></td>
<td><strong>120</strong></td>
</tr>
</tbody>
</table>

3.8 Effective date

September 1, 2017.