

## I. Subject Specification

### 1. Basic Data

#### 1.1 Title

Construction Materials I.

#### 1.2 Code

BMEEOEMAT43

#### 1.3 Type

Module with associated contact hours

#### 1.4 Contact hours

| Type    | Hours/week /<br>(days) |
|---------|------------------------|
| Lecture | 2                      |
| Lab     | 2                      |

#### 1.5 Evaluation

Exam

#### 1.6 Credits

5

#### 1.7 Coordinator

|               |  |
|---------------|--|
| name          | György L. Balázs   |
| academic rank | Professor  |
| email         | <a href="mailto:balazs.gyorgy@emk.bme.hu">balazs.gyorgy@emk.bme.hu</a> |

#### 1.8 Department

Department of Construction Materials and Technologies

#### 1.9 Website

<https://epito.bme.hu/BMEEOEMAT43>

<https://fiek2.mywire.org/course/view.php?id=428>

#### 1.10 Language of instruction

hungarian and english

## 1.11 Curriculum requirements

Compulsory in the Civil Engineering (BSc) programme

## 1.12 Prerequisites

Strong prerequisites:

- Chemistry for Civil Engineers (BMEEOEMAT41)

## 1.13 Effective date

1 September 2017

## 2. Objectives and learning outcomes

### 2.1 Objectives

Students become familiar with the basic mechanical and physical properties of construction materials. Basic physical, mechanical and hydrotechnical properties of the most important structural materials: density (specific gravity), stress-strength, deformation-strain, shrinkage, toughness, brittleness, fatigue, creep, relaxation, hardness. Binder materials: lime, gypsum, cement: production, clinker minerals, hydration and blending. Mortars. Concrete: aggregate mix design, fresh concrete mix design, admixtures, consistency, compaction. Hardened concrete: interpretation of characteristic strength and its evaluation. Metals: iron, steel yield strength, ultimate tensile strength, ultimate strain, weldability. Timber: mechanical properties, shrinkage, swelling. Bricks and masonry elements. Main constituents and properties of glass. Types of polymers.

### 2.2 Learning outcomes

Upon successful completion of this subject, the student:

#### A. Knowledge

1. Knows and adequately uses the terminology of materials
2. Knows the physical-mechanical and chemical properties and their test method of construction materials.
3. Knows the physical and mechanical properties of concrete, metals, glass, timber, brick and plastic.
4. Be aware of the field of building materials,
5. Is able to choose the construction materials for different structural elements.

#### B. Skills

1. Is able to judge the proper structural material significations,
2. Is able to judge and compare the basic material properties,
3. Is able to choose the proper construction material for the structure,
4. Is able to speak and write with appropriate technical terms about each topic of the subject.
5. Is able to apply the theoretical phenomenon during exact technical tasks.

#### C. Attitudes

1. Cooperates with the teacher,
2. Participates in life-long learning (communication, knowledge, technical terms),
3. Open to use up to date information technology,
4. During homework intends to apply different types of gaining knowledge (notes, laboratory protocols, catalogues, online references).

#### D. Autonomy and Responsibility

1. Is able to work alone on homework,
2. Is open to receive critic and develop,
3. Is able to participate in problem solving as part of a group,
4. Participate in professional debates, and can account for his/her opinion.

## 2.3 Methods

Lectures with active participation of students.

## 2.4 Course outline

| Week | Topics of lectures and/or exercise classes   |
|------|--|
| 1.   | History of construction materials.   |
| 2.   | Natural construction materials and their properties.   |
| 3.   | Solids, porous materials, bulks.   |
| 4.   | Concept of binders, the lime circle, gypsum, resins and mineral composition of ordinary Portland cement, hydration, blending, setting and hardening and influencing factors. |
| 5.   | Concept of mortars, concrete types and constituents.   |
| 6.   | Properties of fresh and hardened concrete.   |
| 7.   | Iron: production, composition, properties. Steel: production, composition, types, mechanical properties, corrosion.  |
| 8.   | Timber as construction materials, engineered timber and properties.  |
| 9.   | Brick and masonry elements (history, production, properties).  |
| 10.  | Glass: constituents, production, types, properties.  |
| 11.  | Plastics: types, production, mechanical properties, fields of usage.   |
| 12.  | Summarization.   |
| 13.  | Construction materials in the process of structural design.  |
| 14.  | Summarization.   |

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) Study Aids.
- b) Everett, Alan: Materials. Mitchel's building series. ISBN 0-7134-5442-3
- c) Mindess, Sidney: Concrete. Civil engineering and Engineering Mechanics series. ISBN 0-13-167106-5

## 2.6 Other information

## 2.7 Consultation

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The instructors are available for consultation during their office hours, as advertised on the department website. Special appointments can be requested via e-mail: [balazs.gyorgy@epito.bme.hu](mailto:balazs.gyorgy@epito.bme.hu)

This Subject Datasheet is valid for:

Inactive courses

**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 tests, homework assignments and class work.

## 3.2 Assessment methods

| <b>Evaluation form</b>       | <b>Abbreviation</b> | <b>Assessed learning outcomes</b>   |
|------------------------------|---------------------|-------------------------------------|
| 1. midterm test              | T1                  | A.1-A.4; B.1-B.2, B.4; C.3          |
| 1. control test              | CT1                 | A.1-A.4; B.1-B.2, B.4-B.5; C.3; D.3 |
| 1. homework                  | HW1                 | A.1-A.5; B.1-B.5; C.3-C.4; D.1-D.2  |
| 2. homework                  | HW2                 | A.1-A.5; B.1-B.5; C.1-C.3; D.4      |
| Written and oral examination | E                   | A.1-A.4; B.1-B.2, B.4; C.3          |

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

## 3.3 Evaluation system

| <b>Abbreviation</b>                         | <b>Score</b> |
|---|--------------|
| T1  | 20%          |
| CT1   | 10%          |
| HW1   | 10%          |
| HW2   | 10%          |
| <b>Total achievable during the semester</b> | <b>50%</b>   |
| E   | 50%          |
| <b>Sum</b>                                  | <b>100%</b>  |

## 3.4 Requirements and validity of signature

Signification can be obtained by getting min. 50% of the available points on midsemester results (T1, CT1, HW1, HW2) and perform the required presence on contact hours.

## 3.5 Grading system

| <b>Grade</b>     | <b>Points (P)</b>   |
|------------------|---------------------|
| excellent (5)    | 85 % $\leq$ T       |
| good (4)         | 74 % $\leq$ T < 85% |
| satisfactory (3) | 63 % $\leq$ T < 74% |
| passed (2)       | 50 % $\leq$ T < 63% |
| failed (1)       | 50% < T             |

## 3.6 Retake and repeat

- 1) Second repetition of T1 test is subjected to a fee.
- 2) The CT1 can be retaken during the semester without any charge of fee.
- 3) The Homework can be submitted with fee until 16:00 o'clock of the end of the repetition period or until 23:59 electronically on the same day.

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### 3.7 Estimated workload

| <b>Activity</b>                       | <b>Hours/semester</b> |
|---------------------------------------|-----------------------|
| contact hours                         | 14×4=56               |
| preparation for the courses           | 14                    |
| homework                              | 10                    |
| home studying of the written material | 35                    |
| preparation for the examination       | 35                    |
| <b>Sum</b>                            | <b>150</b>            |

### 3.8 Effective date

1 September 2017

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