

## I. Subject Specification

### 1. Basic Data

#### 1.1 Title

Chemistry of Construction Materials

#### 1.2 Code

BMEEOEMAT41

#### 1.3 Type

Module with associated contact hours

#### 1.4 Contact hours

Type	Hours/week / (days)
Lecture	2

#### 1.5 Evaluation

Midterm grade

#### 1.6 Credits

2

#### 1.7 Coordinator

name	Dr. Kopecskó Katalin
academic rank	Associate professor
email	<a href="mailto:kopecsko.katalin@emk.bme.hu">kopecsko.katalin@emk.bme.hu</a>

#### 1.8 Department

Department of Construction Materials and Technologies

#### 1.9 Website

<https://epito.bme.hu/BMEEOEMAT41>

<https://fiek2.mywire.org/course/view.php?id=348>

#### 1.10 Language of instruction

english

1.11 Curriculum requirements

Compulsory in the Civil Engineering (BSc) programme

1.12 Prerequisites

1.13 Effective date

1 September 2022

## 2. Objectives and learning outcomes

### 2.1 Objectives

The importance and necessity of chemistry in civil engineering: engineering is about design and the rendering of ideas into tangible items. In the design, the engineer must choose the materials for construction. Materials specification spans all the engineering disciplines and provides an opportunity to make chemistry relevant to engineering students. The theme of the semester is introducing material science on a chemical basis and understanding materials on an atomic scale.

The main objectives are: to acquire knowledge about chemical laws; material types; explore the causes of their changes, and recognise the difference between ideal and realistic material systems and microscopic and macroscopic behaviour. Outcomes: application of theoretical knowledge in engineering practice.

### 2.2 Learning outcomes

Upon successful completion of this subject, the student:

#### A. Knowledge

1. knows the generally used conceptual system of chemistry,
2. knows the most important laws of chemistry,
3. understand the main functions between state parameters and variables,
4. understands the chemical explanation of the formation of macroscopic material properties.

#### B. Skills

1. able to chemically explain the behaviour of real substances,
2. able to analyze chemical systems and processes from multiple perspectives.

#### C. Attitudes

1. cooperates with the teacher during the acquisition of knowledge,
2. expands his/her knowledge,
3. strives to learn and routinely use the system of tools required for chemical problem-solving.

#### D. Autonomy and Responsibility

1. take responsibility for the quality of work and the ethical standards that set an example for your classmates, using the knowledge acquired during the course.

## 2.3 Methods

Lectures and individual learning,

During lectures, the understanding of the course material is supported by materials science examples.

## 2.4 Course outline

<b>Hét</b>	<b>Előadások és gyakorlatok témaköre</b>
1.	The importance of studying Chemistry for Civil Engineers.
2.	The structure of atoms, the electron shell structure, the structure of molecules and chemical bonding models.
3.	States of materials - explanation by intermolecular forces. Ideal and real laws of gases. Fluid systems properties.
4.	The structure of crystalline solids (ionic, atomic, molecular and metallic lattice crystal structure and properties).
5.	Difference between ideal and realistic structure, macroscopic properties of crystalline materials, lattice defects.
6.	Structure and properties of non-crystalline (amorphous or glassy) solids.
7.	Macromolecular substances and their chemical properties.
8.	Homogeneous and heterogeneous systems. Gibbs law. interfacial phenomena.
9.	The types of chemical reactions, speed of chemical reactions. Activation energy and reaction heat. Hess's law. Chemical equilibrium.
10.	Acids, bases and salts. The pH concept. Hydrolysis of salts.
11.	Electrochemistry. Redox processes, redox potentials. Production of metals, corrosion of metals.
12.	Binding materials and binding mechanism.
13.	Cement chemistry. Chemical and mineralogical composition of cements.
14.	Hydration products, CSH, CAH, CH, primary and secondary ettringite. Application of theoretical knowledge in engineering practice.

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

- Books: Ebbing: General Chemistry
- Lecture notes
- Downloadable materials: <https://edu.epito.bme.hu/course/view.php?id=74>

## 2.6 Other information

Co-lecturer is Assoc. Prof. Éva Lubl6y.

## 2.7 Consultation

Appointments arranged by email,

Dr Katalin KOPECSK6: kopecsko.katalin@emk.bme.hu

Dr 6va LUBL6Y: lubloy.eva@emk.bme.hu

(Always use the subject "Chemistry")

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 exact time of the evaluations held during the semester is included in the current "Detailed Semester Schedule", which is available on the subject's website.

**3.2 Assessment methods**

<b>Teljesítményértékelés neve (típus)</b>	<b>Jele</b>	<b>Értékelt tanulási eredmények</b>
Test 1	T1	A.1-A.4; B.1-B.2; C.1-C.3; D.1 (2.4 / Topics 1-6.)
Test 2	T2	A.1-A.4; B.1-B.2; C.1-C.3; D.1 (2.4 / Topics 7-14.)

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>Jele</b>	<b>Részarány</b>
T1	50%
T2	50%
<b>Összesen</b>	<b>100%</b>

**3.4 Requirements and validity of signature**

In term-period

- The combined results of the two tests must reach half of the total score,
- Attendance at least 70 % participation in lectures.

**3.5 Grading system**

<b>Mark</b>	<b>Scores (S)</b>
excellent (5)	85-100
good (4)	74-84
satisfactory (3)	62-73
passed (2)	50-62
failed (1)	0-50

**3.6 Retake and repeat**

Possible in the retake (15th) week.

For the exact date see the current "Detailed Semester Schedule", which is available on the subject's website.

**3.7 Estimated workload**

## Chemistry of Construction Materials - BMEEOEMAT41

<b>Activity</b>	<b>Hours/semester</b>
Contact hours	28
Home study for T1	16
Home study for T2	16
<b>Sum</b>	<b>60</b>

3.8 Effective date

1 September 2022

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