



**TECHNICAL UNIVERSITY**  
OF CLUJ-NAPOCA, ROMANIA

**SYLLABUS**

**1. Data about the program of study**

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Civil Engineering
1.3	Department	Civil Engineering and Management
1.4	Field of study	Civil Engineering
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Civil Engineering/ Engineer
1.7	Form of education	Full time
1.8	Subject code	5.00

**2. Data about the subject**

2.1	Subject name	Applied Chemistry									
2.2	Subject area	Civil Engineering									
2.3	Course responsible/lecturer	Associate Professor Ph.D. Eng. Claudiu ACIU <a href="mailto:claudiu.aciu@ccm.utcluj.ro">claudiu.aciu@ccm.utcluj.ro</a>									
2.4	Teachers in charge of seminars	Associate Professor Ph.D. Eng. Claudiu ACIU <a href="mailto:claudiu.aciu@ccm.utcluj.ro">claudiu.aciu@ccm.utcluj.ro</a>									
2.5	Year of study	I	2.6	Semester	1	2.7	Assessment	Exam	2.8	Subject category	DF/DI

**3. Estimated total time**

3.1	Number of hours per week	4	3.2 of which, course:	2	3.3 applications:	2
3.4	Total hours in the curriculum	56	3.5 of which, course:	28	3.6 applications:	28
Individual study						hours
Manual, lecture material and notes, bibliography						35
Supplementary study in the library, online and in the field						-
Preparation for seminars/laboratory works, homework, reports, portfolios, essays						20
Tutoring						10
Exams and tests						4
Other activities						-
3.7	Total hours of individual study	69				
3.8	Total hours per semester	125				
3.9	Number of credit points	5				

**4. Pre-requisites (where appropriate)**

4.1	Curriculum	---
4.2	Competence	Physics; Chemistry

**5. Requirements (where appropriate)**

5.1	For the course	N/A
5.2	For the applications	N/A

## 6. Specific competences

Professional competences	<p>After completing the discipline, students must have theoretical knowledge about:</p> <ul style="list-style-type: none"> <li>- characteristics of building materials, physical properties;</li> <li>- behaviour of the material under the action of water, temperature and loads;</li> <li>- states of substances;</li> <li>- substances systems; interface phenomena;</li> <li>- water in construction;</li> <li>- natural stone in construction. Building materials made of natural stone;</li> <li>- aggregate for mortar and concrete;</li> <li>- non hydraulic inorganic mineral binders, hydraulic.</li> </ul> <p>After completing the discipline, students will be able to:</p> <ul style="list-style-type: none"> <li>- identify the physical features of the porous, compact materials (mass, volume, density, voids volume, compactness and porosity);</li> <li>- establish the physical features of materials under the action of water (humidity and water absorption);</li> <li>- perform determinations regarding the quality of water;</li> <li>- determine the specific surface using Blaine permeameter;</li> <li>- use non-destructive methods (surface mechanic methods and acoustic methods) in order to establish the mechanic characteristics;</li> <li>- determine mechanical strengths of building materials (tensile, flexural and compressive strength);</li> <li>- determine the properties of the aggregates (sand, gravel).</li> </ul>
Cross competences	<ol style="list-style-type: none"> <li>1. Application of effective and responsible work strategies, punctuality, responsibility and personal liability based on principles, norms and values of professional ethics.</li> <li>2. Applying the techniques of effective team work on different hierarchical levels.</li> <li>3. Documentation in Romanian and in a foreign language, for professional and personal development through continuous training and effective adaptation to new technical specifications.</li> </ol>

## 7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	Developing expertise in control and quality assurance in support of training.
7.2	Specific objectives	Assimilating theoretical knowledge concerning the characteristics of the main building materials and methods for their determination.

## 8. Contents

8.1. Lecture (syllabus)		Teaching methods	Notes
1.	Introduction, history, objectives of the course.	Power Point presentation	Video – projector
2.	Characteristics of construction materials, physical properties: mass, weight, volume, density, specific weight, compactness, porosity, voids, volume.		
3.	Materials behaviour under the action of water: humidity, water absorption, permeability, freeze-thaw resistance.		
4.	Materials behaviour under the action of heat, heat conductivity and dilatation.		
5.	Materials behaviour under the action of loads: loads,		

	mechanical properties, efforts and deformations.		
6.	Materials behaviour under the action of static loads and dynamic loads, hardness, wear resistance and fatigue.		
7.	Non-destructive tests of materials: surface mechanical methods, acoustic tests, atomic, electric and combined tests.		
8.	State of aggregation: gas, liquid, solid (system of crystallization amorphous, solids and glass).		
9.	Interface phenomena.		
10.	Substance systems: molecule dispersions, colloidal dispersions, coarse-grained dispersions. Water (structure and properties). Water in constructions.		
11.	Stone in construction, stone materials in construction.		
12.	Aggregates for mortar and concrete (sand).		
13.	Aggregates for mortar and concrete (gravel).		
14.	Mineral binders: non-hydraulic and hydraulic binders.		
<b>Bibliography</b> Daniela Lucia MANEA, Claudiu ACIU (2015). Materiale de Construcții și Chimie Aplicată. Building Materials and Applied Chemistry. Ed. U.T. PRESS, Cluj-Napoca. ISBN 978-606-737-139-0. Florica PAUL (2008). Civil Engineering Materials – Second Edition. Ed. Matrix Rom, Bucuresti. ISBN 973-973-755-315-7.			
<b>8.2. Applications</b>		<b>Teaching methods</b>	<b>Notes</b>
1.	Work protection and safety technique regulation.	Laboratory work presentation and applications	Laboratory works
2.	Units of measurement.		
3.	Determining the physical-mechanical characteristics: mass, weight, volume.		
4.	Calculation of the density; apparent density, bulk density, compactness and porosity.		
5.	Determination of voids volume, humidity, water absorption.		
6.	Determination of the specific surface using the Blaine permeameter.		
7.	Solutions and concentrations.		
8.	Determination of the quality of water.		
9.	Non-destructive tests using mechanical surface methods.		
10.	Non-destructive tests using ultrasonic methods.		
11.	Mechanical tests, practical examples.		
12.	Tests and determinations on sand.		
13.	Tests and determinations on gravel.		
14.	Final evaluation.		
<b>Bibliography</b> Claudiu ACIU, Daniela Lucia MANEA, Alexandru Gheorghe NETEA (2013). Building Materials and Applied Chemistry – Second Edition. Ed. U.T. PRESS, Cluj-Napoca. ISBN 978-973-662-893-1. Livia Ingrid DIACONU (2013). Chemistry for Civil Engineers. Ed. Societatii Academice “MATEI-TEIU BOTEZ”, Iasi. ISBN 978-606-582-045-6.			

**9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field**

Acquired skills will be necessary to the employees who work in the quality control of building materials, civil engineers as well as to the teachers in secondary education.

**10. Evaluation**

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
Course	Multiple choice test (40 questions)	Written test (40 minutes)	60%
Applications	Solving 6 problems	Written test (40 minutes)	20%
Laboratory works	Test of laboratory works – 5 questions	Test after each laboratory work	20%
10.4 Minimum standard of performance			
Mark components: Laboratory (mark L); Problems (mark P); Multiple choice test (mark G).			
Mark computation formula: $N = 0,2L + 0,2P + 0.6G$ ; is calculated only if: $L \geq 5$ , $P \geq 5$ and $G \geq 5$ .			

Date of filling in  
29.09.2017

Teachers in charge of seminars  
Associate Prof. Ph.D. Eng. Claudiu ACIU

Date of approval in the department  
29.09.2017

Head of department  
Associate Prof. Ph.D. Eng. Claudiu ACIU