

COURSE SYLLABUS AND COURSE REQUIREMENTS

ACADEMIC YEAR 2024/2025 SEMESTER AUTUMN

<i>Course title</i>	<i>Materials Science</i>
<i>Course Code</i>	MSB021ANEP
<i>Hours/Week: le/pr/lab</i>	200
<i>Credits</i>	2
<i>Degree Programme</i>	Civil Engineering BSc
<i>Study Mode</i>	Full-time schedule
<i>Requirements</i>	Mid-semester grade
<i>Teaching Period</i>	1. semester
<i>Prerequisites</i>	-
<i>Department(s)</i>	Civil Engineering Department
<i>Course Director</i>	Dr Anita Dolgosné Kovács
<i>Teaching Staff</i>	Dr Adél Len

COURSE DESCRIPTION

The course provides basic knowledge about materials structure on various - atomic, mesoscopic, macroscopic - levels, on destructive and non-destructive methods for studying the structure of materials. It gives an overview on the basic construction materials and the most actual developments in the field of construction materials. The course topics starts from the smallest entities of the material, and builds up the macroscopic objects step by step, with emphasis on the composition of construction materials. Several novel building materials will also be discussed.

SYLLABUS

1. GOALS AND OBJECTIVES

Students will gain from this course:

- Knowledge about materials chemical and physical properties
- Knowledge on methods of studying materials structure
- Knowledge about various novel materials used especially in construction
- Experience in understanding a scientific paper and experience in presenting a new topic before an audience

2. COURSE CONTENT

TOPICS

LECTURE

1. *Introduction. From quarks to atoms. Atomic structure*
2. *Periodic table. Elements. Compounds. Mixtures*
3. *Chemical bonding. Solid, liquid and gas phases. Amorphous and crystalline structure*
4. *Real crystals, crystallographic defects*
5. *Solid construction materials*
6. *Novel materials in construction*
7. *Destructive and non-destructive methods for studying the characteristics of materials*

DETAILED SYLLABUS AND COURSE SCHEDULE

LECTURE

week	Topic	Compulsory reading; page number (from ... to ...)	Required tasks (assignments, tests, etc.)	Completion date, due date
1.-9.	NO LECTURE		A list of individual tasks and the orientation for the task to be completed will be given in the Microsoft Teams Group. Choice of the individual task. Work on the task.	Choice of the task by the 3 rd week class.
10.	Course description. Orientation. Explanation of students' tasks. Introduction. From quarks to atoms. Atomic structure. Periodic table. Elements. Compounds. Mixtures	[1.] page 1-29	Work on the individual task.	
11.	Chemical bonding. Solid, liquid and gas phases. Amorphous and crystalline structure. Real crystals, crystallographic defects	[1.] pages 29-59 and 104-125	Work on the individual task.	
12.	Solid construction materials. An overview	[2.] pages 121-132, 139-141, 155-156, 168-170, 207-216,	Upload the ppt presentation to the Microsoft Teams group.	Completion of the task by the 13 th week class.
13.	Novel materials in construction. Destructive and non-destructive methods for studying the characteristics of materials	[3.] - website	Multiple choice test in Neptun.	Completion by the end of semester.
14.	Students presentations			

3. ASSESSMENT AND EVALUATION

ATTENDANCE

In accordance with the Code of Studies and Examinations of the University of Pécs, Article 45 (2) and Annex 9. (Article 3) a student may be refused a grade or qualification in the given full-time course if the number of class absences exceeds **30% of the contact hours** stipulated in the course description.

In case of illness, it is necessary to present a medical certificate. In case of absence, the student makes up for the missed class material.

Method for monitoring attendance (e.g.: attendance sheet / online test/ register, etc.)

Attendance sheet

ASSESSMENT

Type	Assessment	Ratio in the final grade
Students presentations	100	50 %
Multiple choice test	100	50 %

Opportunity and procedure for re-takes (PTE TVSz 47§(4))

Unsuccessful presentations and failed multiple choice tests can be repeated once in the first week of the examination period.

Grade calculation as a percentage

based on the aggregate performance according to the following table

Course grade	Performance in %
excellent (5)	85 % ...
good (4)	70 % ... 85 %
satisfactory (3)	55 % ... 70 %
pass (2)	40 % ... 55 %
fail (1)	below 40 %

The lower limit given at each grade belongs to that grade.

4. SPECIFIED LITERATURE

In order of relevance. (In Neptun ES: Instruction/Subject/Subject details/Syllabus/Literature)

COMPULSORY READING AND AVAILABILITY

- [1.] James F. Shackelford, 2015, *Introduction to materials science for engineers*, Pearson Higher Education Inc., Upper Saddle River
- [2.] Ash Ahmed, John Sturges, 2015, *Materials Science in Construction: An Introduction*, Routledge Taylor and Francis Group, London and New York
- [3.] *What is the difference between non destructive testing & destructive testing?* online article, published on 24-Mar-2023, <https://www.onestopndt.com/ndt-articles/what-is-the-difference-between-ndt-destructive-testing>

RECOMMENDED LITERATURE AND AVAILABILITY

- [4.] A. Mukherjee, Deepmala, P. Srivastava et al., *Application of smart materials in civil engineering: A review*, Materials Today: Proceedings, Volume 81, Part 2, 2023, Pages 350-359 <https://doi.org/10.1016/j.matpr.2021.03.304>
- [5.] A. Tabrizikahou, M. Kuczma, P. Nowotarski, M. Kwiatek, M, A. Javanmardi, *Sustainability of Civil Structures through the Application of Smart Materials: A Review*, Materials 2021, 14, 4824. <https://doi.org/10.3390/ma14174824>
- [6.] William D. Callister Jr., 2007, *Material Science and Engineering*, John Wiley and Sons Inc., New York
- [7.] U.S. Department of Energy, 1993, *DOE FUNDAMENTALS HANDBOOK, Material Science*, Vol.1, US Department of Energy, Washington DC
- [8.] J. W. Morris Jr., 2007, *A Survey of Materials Science*, Department of Material Science and Engineering, Berkley
- [9.] Slides of the lectures – uploaded to Microsoft Teams group