BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS
FACULTY OF MECHANICAL ENGINEERING

SUBJECT DATASHEET

I. SUBJECT DESCRIPTION

1. GENERAL DATA

1.1. Subject name (in Hungarian, in English)

Materials science and testing • Materials Science and Engineering

1.2. Neptun code

BMEGEMTBGA1

1.3. Type

study unit with contact hours

1.4. Course types and number of hours (weekly / semester)

course type	number of hours (weekly)	nature (connected / stand-alone)
lecture (theory)	4	-
exercise	-	-
laboratory exercise	1	coupled

1.5. Type of assessments (quality evaluation)

exam

1.6. ECTS

6

1.7. Subject coordinator

name:	Dr. Szabó Péter János
post:	university professor
contact:	szpj@eik.bme.hu

1.8. Host organization

Department of Material Science and Engineering (http://www.att.bme.hu)

1.9. Course homepage

http://www.att.bme.hu

1.10. Course language

hungarian

1.11. Primary curriculum type

mandatory

1.12. Direct prerequisites

Strong prerequisite: -

Weak prerequisite: -

Parallel prerequisite: -

Milestone prerequisite: -

Excluding condition: -

(the subject cannot be taken if you have previously completed any of the following subjects or groups of subjects)

2. AIMS AND ACHIEVEMENTS

2.1. Aim

The course provides knowledge about the structure and properties of metallic materials, their changes and their interactions. They provide the basis for the knowledge required to reliably select materials for different equipment in accordance with the design and manufacturing technology. The course introduces the basic mechanical and non-destructive material testing measurements and the equipment required for them.

2.2. Learning outcomes

Competences that can be acquired by completing the course:

A. Knowledge

- 1. The student is familiar with metallic structural materials and their most important properties.
- 2. The student is familiar with the aims, main areas, possibilities and methods of material testing.
- 3. The student distinguishes between crystalline materials, space lattices, lattice systems and their characteristics.
- 4. The student knows realistic lattice structures, lattice defects and their effect on the properties of metals.
- 5. The student understands the crystallization mechanisms of metals and alloys.
- 6. The student systematizes the properties of solid solutions, compounds, eutectics and the conditions of their formation.
- 7. The student is aware of the material structure and phenomenological description of diffusion.
- 8. The student understands the behavior of iron-carbon alloys under unbalanced conditions.
- 9. The student systematizes the possibilities of restoring the fabric structure and properties by means of regeneration processes (regeneration, recrystallization, softening).
- 10. The student informed about the effect of state factors (stress state, strain rate and temperature) on mechanical properties.
- 11. The student understands the material testing metrics that can be used to assess fracture safety, the limitations of their application.
- 12. The student understands the phenomenon of creep, its explanation, sizing possibilities and metrics, the phenomenon, explanation, statistical approach and metrics of fatigue.

B. Ability

- 1. The student is able to propose the material to be used and the production technology, knowing the specific application and system of requirements.
- 2. The student is able to group and identify different substances.
- 3. The student is able to propose the heat treatment technology of a given part.
- 4. The student makes a proposal for the testing technology of a given component.
- 5. The student proposes the main parameters of the selected production technology.
- 6. The student expresses his thoughts in an orderly form orally and in writing.
- 7. The student interprets the material structure and phenomenological description of diffusion.

- 8. The student interprets the behavior of iron-carbon alloys under unbalanced conditions.
- 9. The student analyzes the material test metrics suitable for assessing fracture safety and the limitations of their application.
- 10. The student manages the possibilities of restoring the fabric structure and properties by means of regeneration processes (regeneration, recrystallization, softening).
- 11. The student handles the effect of state factors (stress state, strain rate and temperature) in relation to mechanical properties.
- 12. The student analyzes the phenomenon of creep, its explanation, sizing possibilities and metrics, the phenomenon, explanation, statistical approach and metrics of fatigue.

C. Attitude

- 1. The student develops collaboration with the instructor and fellow students in expanding knowledge.
- 2. The student expands his professional knowledge and knowledge through continuous acquisition of knowledge.
- 3. The student is open to the use of information technology tools.
- 4. The student strives to get to know and routinely use the system of tools needed for thermodynamic problem solving in material and technology selection.
- 5. The student strives for accurate and error-free problem solving.

D. Independence and responsibility

- 1. independently considers material and technology selection tasks and problems and solves them on the The student basis of given resources.
- 2. The student accepts the well-founded and critical remarks made in connection with its activities.
- 3. The student in some situations - as part of a team - cooperates with his / her fellow students in solving the tasks.
- 4. The student always supports a systems approach in his thinking.
- 5. The student feels responsible for the activities of his co-workers.

2.3. Teaching methodology

Lectures to acquire the theoretical foundations of the curriculum in the form of computer-assisted presentations. Laboratory exercises to practice the theoretical knowledge of the curriculum in order to acquire the practical application of the knowledge contained in the theoretical curriculum. During the training, communication with lecturers and fellow students in writing and orally, use of IT tools and techniques, tasks prepared independently and in group work.

2.4. Support materials

a) Textbooks

-

b) Lecture notes

-

c) Online materials

http://www.att.bme.hu

2.5. Validity of the course description

Start of validity:	2024. January 10.
End of validity:	2028. July 15.

II. SUBJECT REQUIREMENT

3. ACHIEVEMENT CONTROL AND EVALUATION

3.1 General rules

3.2 Assessment methods

A. Detailed description of mid-term assessments

1. Mid-term assessment

type: summative assessment

count: 2

purpose, description: A complex, written way of evaluating the subject and knowledge, ability type competence elements in the form of a dissertation. The dissertation basically focuses on the application of the acquired knowledge, so it focuses on problem recognition and solution solution, ie practical (calculation) tasks must also be solved during performance evaluation. The part of the curriculum on which the assessment is based is determined by the lecturer of the subject in agreement with the supervisors, the available working time is 60-90 minutes.

2. Mid-term assessment

type: diagnostic assessment

count: 6

purpose, description: In order to successfully carry out further studies within the subject, it is absolutely necessary to check the existence of knowledge-type competence elements in writing (control dissertation), which takes place during the practical session of the subject; the part of the curriculum on which the level assessment is based is determined by the supervisor; test papers may consist of theoretical questions to be explained, which are lexical knowledge; from test questions, which are the interpretation of each concept and the recognition of the connections between them; and computational tasks that examine problem-solving-solving ability; the available working time is a minimum of 10 and a maximum of 25 minutes.

B. Detailed description of assessments performed during the examination period (if relevant)

Elements of the exam:

1. written partial exam

obligation: mandatory (partial) exam unit, failing the unit results in fail (1) exam result

description: Írásbeli teljesítményértékelés, amelynek során a vizsgázó számot ad a tantárgy tudás, képesség, attitűd, valamint önállóság és felelősség típusú kompetenciaelemeinek elsajátításáról, különös tekintettel az anyagszerkezettan, anyagvizsgálat, anyagtulajdonságok témakörében. Az értékelés alapjául szolgáló tananyagrészt a tantárgy előadója határozza meg. A vizsga során rövid, ellenőrző jellegű kérdések ("kiskérdések") és hosszabban megválaszolandó, esszé jellegű kérdések egyaránt lesznek. Az írásbeli vizsga alapján, annak sikeressége esetén elégséges vagy közepes érdemjegy szerezhető, jó vagy jeles vizsgajegy megszerzéséhez szóbeli vizsga is szükséges.

2. oral partial exam

obligation: (partial) exam unit chosen by the student, the exam result assessed by other partial exam unit can be changed unrestrictedly

description:Oral performance evaluation, during which the candidate gives an account of the acquisition of the knowledge, ability, attitude, as well as independence and responsibility type competence elements of the subject, especially in the field of material structure, material testing, material properties. The part of the curriculum on which the assessment is based is determined by the lecturer of the subject. During the exam, the examiner asks a question from the pre-issued subject matter, the candidate begins to answer the question, and then a professional dialogue develops between the examiner and the candidate.

3. practical partial exam

-

4. inclusion of mid-term results

-

3.3 The weight of mid-term assessments in signing or in final grading

identifier	**weight**
1 . Mid-term assessment	100 %
2 . Mid-term assessment	100 %

The condition for signing is that the score obtained in the mid-year assessments is at least **40%**.

3.4 The weight of partial exams in grade (if relevant)

type	**weight**
written partial exam	60 %
oral partial exam	40 %
practical partial exam	0 %
inclusion of mid-term results	0 %

3.5 Determination of the grade

grade ● [ECTS]	**the grade expressed in percents**
very good(5) ● Excellent [A]	above 90%
very good(5) ● Very Good [B]	85% .. 90%
good(4) ● Good [C]	70% .. 85%
satisfactory(3) ● Satisfactory [D]	55% .. 70%
sufficient(2) ● Pass [E]	41% .. 55%
insufficient(1) ● Fail [F]	below 41%

The lower limit specified for each grade already belongs to that grade.

3.6 Attendance and participation requirements

Must be present at at least **70%** (rounded down) of lectures.

At least **100% of** laboratory practices (rounded down) must be actively attended.

3.7 Special rules for improving, retaken and replacement

The special rules for improving, retaken and replacement shall be interpreted and applied in conjunction with the general rules of the CoS (TVSZ).

Need mid-term assessment to individually complete?

yes

The way of retaking or improving a summary assessment for the first time:

each summative assessment can be retaken or improved

Is the retaking-improving of a summary assessment allowed, and if so, than which form:

retake or grade-improving exam not possible

Taking into account the previous result in case of improvement, retaken-improvement:

new result overrides previous result

Completion of unfinished laboratory exercises:

missed laboratory practices must be performed in the repeat period

Repetition of laboratory exercises that performed incorrectly (eg.: mistake in documentation):

incorrectly performed laboratory practice (e.g. Incomplete/incorrect report) can be corrected upon improved re-submission

3.8 Study work required to complete the course

Activity	**hours / semester**
participation in contact classes	70
preparation for laboratory practices	14
preparation for summary assessments	32
exam preparation	42
additional time required to complete the subject	22
summary	**180**

3.9. Validity of subject requirements

Start of validity:	2024. January 10.
End of validity:	2028. July 15.

4. ADDITIONAL INFORMATION

4.1 Primary course

The primary (main) course of the subject in which it is advertised and to which the competencies are related:

Mechanical engineering

4.2 Link to the purpose and (special) compensations of the Regulation KKK

This course aims to improve the following competencies defined in the Regulation KKK>

a) knowledge

- Student has the comprehensive knowledge of the main properties and applications of structural materials used in engineering.

b) ability

- Student has the ability to carry out laboratory testing and analysis of materials used in the engineering field, and to evaluate and document test results.

c) attitude

- In the course of student's work, Student will explore the possibility of setting research, development and innovation objectives and strive to achieve them.

d) independence and responsibility

- Student takes initiative in solving technical problems.

4.3 Prerequisites for completing the course

Knowledge type competencies	
(a set of prior knowledge, the existence of which is not obligatory, but greatly facilitates the successful completion of the subject)	-
Ability type competencies	
(a set of prior abilities and skills, the existence of which is not obligatory, but greatly contributes to the successful completion of the subject)	-