Material Models in Mechanics - BMEEOTMDT72

I. Subject Specification

1. Basic Data

1.1 Title

Material Models in Mechanics

1.2 Code

BMEEOTMDT72

1.3 Type

Module with associated contact hours

1.4 Contact hours

Type	Hours/week / (days)
Lecture	2

1.5 Evaluation

Exam

1.6 Credits

3

1.7 Coordinator

name	Dr. Tóth Brigitta
academic rank	Associate professor
email	toth.brigitta@emk.bme.hu

1.8 Department

Department of Structural Mechanics

1.9 Website

https://epito.bme.hu/BMEEOTMDT72
https://fiek2.mywire.org/course/view.php?id=2555

1.10 Language of instruction

hungarian and english

1.11 Curriculum requirements

Ph.D.

1.12 Prerequisites

1.13 Effective date

1 September 2022

2. Objectives and learning outcomes

2.1 Objectives

The modeling of different materials is one of the most difficult questions of mechanics. This lecture explains the basic (micro and macro) physical reasons of the different material behaviors, starting from the elastic state until the (plastic and/or fracturing) collapse. It introduces the thermodynamical principles of the constitutive equtaions, explains the different micromechanical and phenomenological modeling of material behaviors and their numerical applications for the different finite element simulations too.

2.2 Learning outcomes

Upon successful completion of this subject, the student:

A. Knowledge

1. A general theoretical overview about the different versions of engineering material models and the knowledge of the applicability of these models in the engineering design processes.

B. Skills

1. The correct application of the material models in the different engineering problems,
2. The knowledge of the conditions of the good applications.
3. The ability of the selection among the advantageous or/and disadvantaged material models.

C. Attitudes

1. Individually creates linear and nonlinear elastic, elasto-plastic and fracturing material models in case of practical engineering problems.

D. Autonomy and Responsibility

1. Endeavors to discover and routinely use the tools necessary to the problem solving of material modeling of mechanics.
2. Endeavors to the precise and error-free problem solving for material modeling.

2.3 Methods

Presentations.

2.4 Course outline

Hét	**Előadások és gyakorlatok témaköre**
1.	The history of the material modeling, the new trends.
2.	The effect of the microstucture for the material behaviors.
3.	The basic strength parameters in the function of the microstructure.
4.	The basic physical charactereistics of the material models. Micromodels.
5.	The classification of the elastic material models. The Cauchy models.
6.	The Green hyperelastic models. The stability conditions of the constitutive equations.
7.	The large strain hyperelastic models. Hypoelastic models.
8.	The basic parameters of the plastic behavior. The yield and hardening conditions. The deformation theory.
9.	The incremental theory of the plasticity . The effect of the large plastic strains.
10.	Return mapping algorithms. Te special version of quasi-static and cyclic models of elastic-plastic metals.
11.	Elastic-plastic models of the concretes and soils.
12.	Complex models of rigid materials. The models of continuum damage mechanics.
13.	Speficic models of CDM.
14.	Paremeter determination of the material models.

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

- Bojtar: Material models. Lecture notes.
- Ashby-Jones: Engineering materials 1-3. Elsevier.
- Callister: Material science and engineering. John Wiley.

2.6 Other information

2.7 Consultation

At the appointed time.

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This Subject Datasheet is valid for:

Inactive courses

II. Subject requirements

Assessment and evaluation of the learning outcomes

3.1 General rules

3.2 Assessment methods

Teljesítményértékelés neve (típus)	Jele	Értékelt tanulási eredmények
Oral exam	1	A.1; B.1, B.2, B.3; C.1; D.1, D.2

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

3.3 Evaluation system

Jele	Részarány
1	100
Összesen	**100%**

3.4 Requirements and validity of signature

The succesfull oral exam.

3.5 Grading system

Érdemjegy	Pontszám (P)
jeles (5)	100-86
jó (4)	85-70
közepes (3)	69-60
elégséges (2)	59-50
elégtelen (1)	<50

3.6 Retake and repeat

If it is necessary, the oral exam should be repeated.

3.7 Estimated workload

Tevékenység	Óra/félév
Individual work.	40
Összesen	**40**

3.8 Effective date

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