


Department of Materials Science and Engineering



Introduction

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Building MT, 60/B
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Materials Engineering
BMEGEMTBGF1
2022 Fall semester

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Venue



The subject will be held **in-person form**. For the lectures and and laboratories please wait in the lobby of building G in time.

The lectures will be held at **every Monday 10:15 – 12:00**.

Personal consultation is provided on every Monday from 12:00 – 13:00 in BME building MT, office 60/B. If you would like to consult about the lessons, please write an email to varbai.balazs@gpk.bme.hu on the previous day.


The laboratories will also be held in building G. **The laboratory practices will start on the 2nd week**. Please follow the instructions of your laboratory group leader.

The exams will be held at the end of the semester.



If you have any question, feel free to contact me through varbai.balazs@gpk.bme.hu.

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Venue






Lectures

- G building 120
- Every Mondays, 10:15 – 12:00

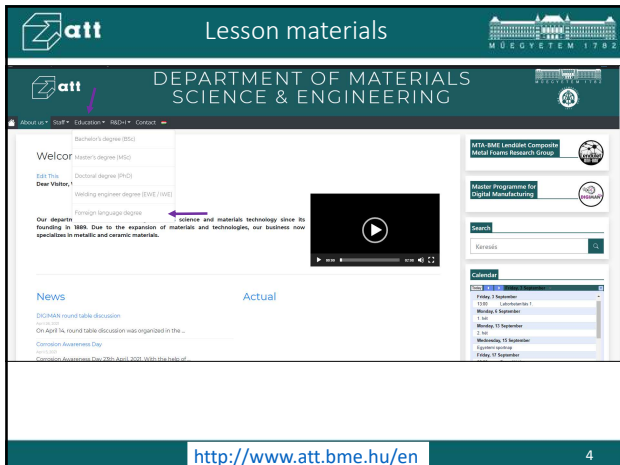
Laboratory practice

- G building, please wait in the hall
- L1 → Every second Monday, starting from the 2nd week 16:15 – 17:45
- L2 → Every second Wednesday, starting from the 2nd week, 12:15 – 13:45

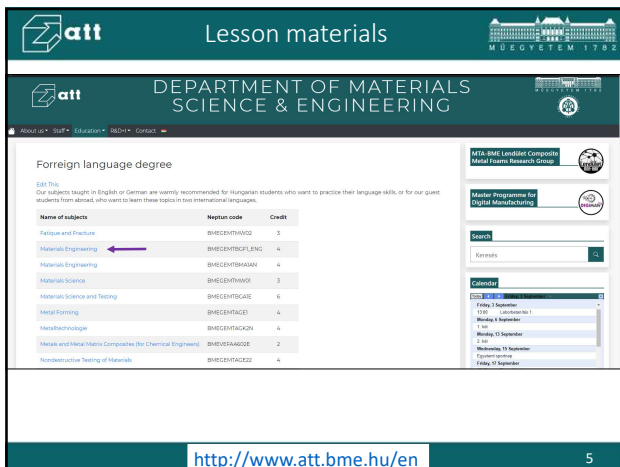



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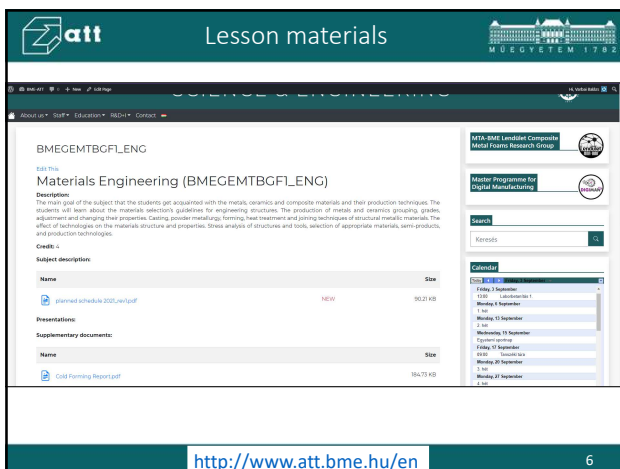
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A screenshot of the website for the Department of Materials Science & Engineering at BME (BMEGYTEM 1782). The page features a navigation menu with options like 'About us', 'Staff', 'Education', 'Research', and 'Contact'. A central section titled 'Welcome' includes a video player. Below this, there are sections for 'Our departments' and 'News'. A sidebar on the right contains information about research groups (MTA-BME Lendület Composite Metal Foams Research Group, Master Programme for Digital Manufacturing) and a calendar for the month of September. A search bar is also present. The URL 'http://www.att.bme.hu/en' and the page number '4' are visible at the bottom.


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A screenshot of the 'Foreign language degree' page. It lists various subjects with their Neptun codes and credit values. A purple arrow points to the 'Materials Engineering' entry with code BMEGEMTBGFLENG. The table includes subjects like Fatigue and Fracture, Materials Engineering, Materials Science, Materials Science and Testing, Metal Forming, Materials Technology, Metals and Metal Matrix Composites for Chemical Engineers, and Nondestructive Testing of Materials. The right sidebar shows the same navigation and calendar information as the previous screenshot. The URL 'http://www.att.bme.hu/en' and the page number '5' are at the bottom.

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A screenshot of the 'Materials Engineering (BMEGEMTBGFLENG)' page. It provides a detailed description of the subject, its goals, and its credits. Under 'Subject description', there are links to 'Interned schedule 2022_en.pdf' (3023 KB) and 'Gold Forming Report.pdf' (36473 KB). The right sidebar features the same navigation and calendar information. The URL 'http://www.att.bme.hu/en' and the page number '6' are at the bottom.

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att Prior knowledge 

Materials Science and Testing discipline

- Rudiments of physics and chemistry
- Materials structure, mechanical properties, effect of temperature, deformation speed, and stress state on the mechanical behavior
- Materials testing methods
- Microstructural and property changes during heat treatment in metals
- Damage and fatigue of metals
- The effect of manufacturing processes on properties

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att Topics of the course 

- **Metals**, ceramics and composite materials for engineering purposes, and their production techniques.
- Adjustment and changing of properties.
- Casting, powder metallurgy, forming, heat treatment and joining techniques of structural metallic materials.
- The effect of technologies on the materials structure and properties.
- Materials selection's guidelines for engineering structures.

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att Materials Engineering → Metals Technology 

„Technology“ Greek origin

„Technos“ → technical
„logos“ → logical

Theory and practice of some technical processes.



*Production, planning, organizations
(+ information and experience)*

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att Materials Engineering → Metals Technology

Meaning changed with time

Before the industrial revolution:
The sum of the knowledge of a single worker.

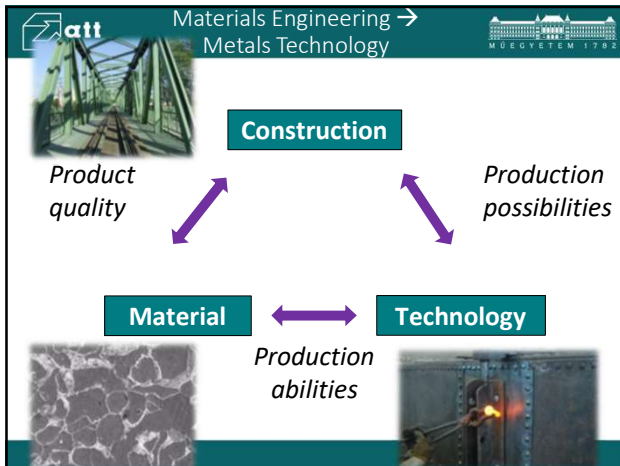
After the industrial revolution, first part of XIX century:
Manufacturing industry, technical knowledge and the science are separated into various technologies.

After the industrial revolution, second part of XIX century:
Mass production, important technologies:
Mechanization, automatization, organization

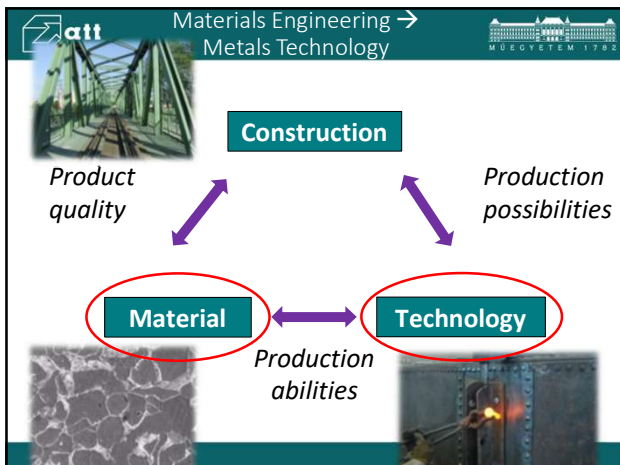
From the XX century:
New disciplines (electronics, informatics, computer science), various scientific background, digital manufact., industry 4.0

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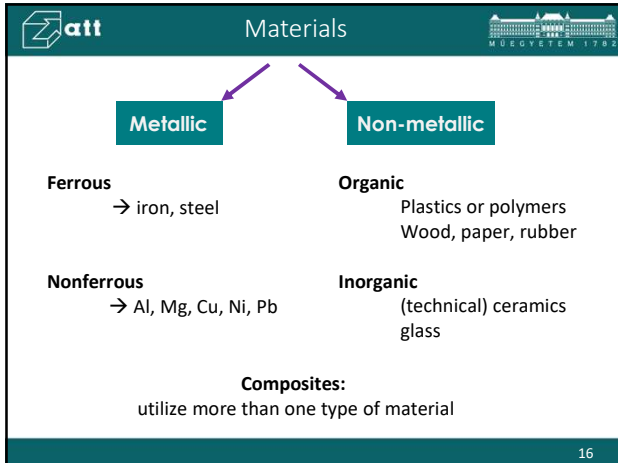
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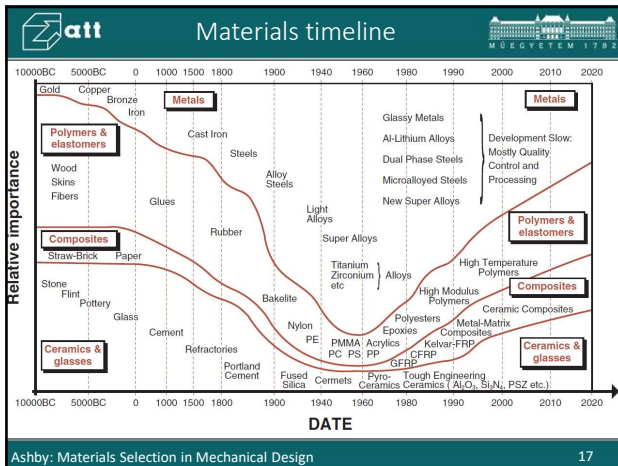
14



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Materials properties

The properties of materials are determined by **two group of factors**:

Internal factors → determine the material's structure

- Chemical composition (impurity and alloying)
- Microstructure (equilibrium or non-equilibrium phases, their amount, quality distribution, and sizes)

External factors → determine the service condition of a machine part

- Temperature (mean value and amplitude)
- Rate of deformation
- Stress state
- Chemical effects
- Corrosion effects
- Irradiation effects

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att Internal factors

Internal factors are determined by:

- Metal production
- Form making
- Forming
- Heat treating
- Surface treating
- Joining process

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att External factors

External factors – service conditions are determined by how the machine part is used

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att General layout of the discipline

Never pure, contains impurities

Ores

Metal producing technologies:
iron and steel making
Producing of nonferrous metals

Metals

Form making technologies:
casting, pre-forming by plastic deformation
Powder metallurgy

Cast ingot, castings, rolled bloom, billet, rod, wire, strip, sheet, forged bar, block

Semi-products

Forming processes, machining processes, heat treatments and surface treatments



Products

Joining process:
Welding, brazing, etc.

Machine

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 Textbooks and resources 

- Department of Materials Science and Engineering
webpage: www.att.bme.hu/en
- W. D. Callister:
Materials Science and Engineering, An Introduction.
- S. Kalpakjian, S.R. Smith:
Manufacturing Engineering and Technology
- Michael F. Ashby:
Materials Selection in Mechanical Design

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Thank you for your attention!

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