

# Введение в материаловедение I

**Lecturers:**

Антон Герт

**Assistants:**

Владимир Ширококов

**Language:**

English

**Credit points:**

6 э.е.

**Monitoring type:**

Exam

**Educational Program:**

Нанопотоника

2 семестр

Гибридные материалы

2 семестр

Квантовые материалы

2 семестр

Компьютерное моделирование квантовых и нанопотонных систем

2 семестр

**Prerequisites:**

Математический анализ

Дифференциальные уравнения

Общая физика: термодинамика и статистическая физика

Физика твердого тела

Физическая химия

Lectures (a.h)*	Practice (a.h)	Labs (a.h)
32	32	
*1 academic hour = 45 minutes		

Materials science is a course that studies the patterns that determine the structure and properties of materials depending on their composition and processing conditions. The purpose of the course is to give the basics of materials science, the principles of choosing structural materials, the technology of their production and processing; to instill skills of practical determination of physical and mechanical properties of materials and directed impact on them; to expand the scientific and technical horizons of students. Objectives of the lectures: to acquaint students with the current state of the science of the structure and properties of metallic and non-metallic materials, methods of production and processing; to teach students to navigate the variety of modern structural materials, to know their classification and labeling, as well as the main trends in the creation of materials of the future based on the achievements of scientific and technological progress

## Course content

### Plan of a course

### Структура курса

#### 1) **Understand the crystallographic classification of materials:**

Structure

Symmetries

#### 2) **Defects of crystalline structure:**

Origin

Types

Influence on properties

#### 3) **Basics in Thermodynamics of Materials:**

Gibbs energy curves

#### 4) **How materials grow:**

Thermodynamic approach (Surface vs. Volume)

Kinetic approach (JMAK models)

#### 5) **How does microstructure influence properties:**

Mechanical

Optical

At different scales

#### 6) **Processes to control materials microstructure**

## Recommended resources

1) Material Science and Metallurgy by OP Khanna

2) Thermodynamics in Material Science by Robert Dehoff

3) Structure of the Crystalline Solids, Imperfections and Defects in Crystals by Costel Rizescu, Mihaela Rizescu

4) Introduction to Phase Diagrams in Materials Science and Engineering by Hiroyasu Saka

5) Control of Microstructures and Properties in Steel Arc Welds by Lars-Erik Svensson

## Grading Policy

Test (1:30 hour) with all documents allowed

Presentation of the material science problematic of your Master thesis and presentation of your strategy.