**Semmelweis University Faculty of Dentistry**

<table>
<thead>
<tr>
<th><strong>Name of the course:</strong></th>
<th>Physical Foundations of Dental Materials Science</th>
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<tbody>
<tr>
<td><strong>Credit value:</strong></td>
<td>2</td>
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<tr>
<td><strong>Lessons (in hours):</strong></td>
<td>28 lectures: 28 practicals: seminars:</td>
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<td><strong>Type of the course:</strong></td>
<td>compulsory obligatory elective elective</td>
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<td><strong>Frequency of announcement (per semester or year):</strong></td>
<td>per year</td>
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<tr>
<td><strong>Academic year:</strong></td>
<td>2020/21 1st. semester</td>
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<tr>
<td><strong>Subject code:</strong></td>
<td>1</td>
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**Lecturer of the course:** Zsolt Mártonfalvi, PhD

**Contact:** Department of Biophysics and Rwdiation Biology, martonfalvi.zsolt@med.semmelweis-univ.hu, Tel: 459-1500/60231

**The goals of the course in point of view of the education:**

- To provide knowledge in the foundamental physical phenomena, quantities and context related to dental materials science, odontotechnology, implantology and orthodontics.
- To impart knowledge about the structure and physical properties of materials commonly used in dental practice.
- To study the logic of scientific approach and to reveal the importance of materials science for future dentist.

**Location of the course (address of lecture hall, seminar room etc.):**
Basic Medical Science Center, 1094 Budapest, Tűzoltó u. 37-47.

**Competences acquired by completion of the course:**

- Knowledge about the foundamental physical and mechanical concept of materials science.
- Knowledge about the physical and mechanical properties of dental material families.
- Knowledge about the foundamental physical concept related to implanology, odontotechnology and orthodontics.

**Pre-study requirements and prerequisites of course registration and completion:** none

**Number of students required for announcement of course (min., max.):** compulsory subject

**Method of course registration:** Through the NEPTUN system.

**Detailed course/lecture description:**

1. **Foundamentals of material structure.**
   Atomic interactions, bonds. Multiatomic systems, gases. Interpretation of temperature, Boltzmann-distribution.
2. Fluids, solids, liquid crystals.
4. Methods for structural examination (diffraction, microscopic, spectroscopic methods)
6. Polymers, composites.
7. **Mechanical and other properties of material families.**
   - Mechanical properties of materials 1. Elasticity.
10. Thermal and electrical properties of materials.
11. Optical properties of materials. Comparison of the properties of dental materials based on their structure.
12. **Foundations of biomechanics.**
    - Structure, mechanical and other properties of dental tissues.
13. Physical bases of implantology.

**Courses (obligatory and elective) which in part or entirely overlap the topics of above course:**
- Biophysics I., Physical Bases of Biophysics

**Special academic work required for completion of the course**: -

**Attendance on practices and lectures, replacement in case of missed sessions:**
75% attendance is mandatory

**Consequences of absence from sessions and exams**: according to the study and exam regulations

**Method of checking acquired knowledge during the study period**: 5

**Requirements of an accepted semester (signature of the lecturer)**: -

**Type of the exam**: written semifinal

**Requirements of the exam**:

2. Fluids, water, liquid crystals.
5. Phase, phasediagram, phase transitions.
6. Methods for structural examination I. (light and electron microscope)
7. Methods for structural examination (diffraction-based methods, scanning methods)
8. Physical and mechanical properties of metals and alloys.
12. Mechanical properties of materials 2: Description of plasticity, hardness.
13. Mechanical properties of materials 3. Fractures, fatigue, impact test
15. Thermal, electrical and optical properties of materials.
16. Comparison of the properties of dental materials based on their structure.
17. Biomechanics 1. Forces, levers related to human body. Mandible as a lever, masticatory forces.
18. Mechanical, electrical, optical and thermal properties of dental tissues.
Grading of courses: Based on the written semifinal exam. 0-50% failed, 51-63% passed, 64-75% average, 76-87% good, 88-100% excellent. Depending on the result of the midterm, additional extra points may be added to the semifinal result.

Exam registration: Through the NEPTUN system.

Rules of repeating exams: according to the study and exam regulations

List of textbooks, lecture notes and recommended textbooks:
Ferenc Tölgyesi, PhD: Physical Bases of Dental Material Science (e-book)
Lecture slides
http://biofiz.semmelweis.hu

Further readings:
Phillips’: Science of Dental Materials
Richard van Noort: Introduction to Dental Materials

Signature of course lecturer:

Signature of head of department:

Date of submission: 2020. 05. 11.

Opinion of OKB:

Notes from the Dean’s Office:

Signature of Dean:

1 Filled out by the Dean’s Office following approval
2 Detailed and numbered for each week of theoretical and practical lessons one by one, indicating the names of lecturers and instructors
3 Eg. field practice, medical chart analysis, survey conducting, etc.
4 Eg. homework, report, midterm exam etc. Topics, dates, method of retake and replacement.
5 List of topics in case of theoretical exam, thematic and method in case of practical exam.
6 Method of inclusion of theoretical and practical exams. Method of inclusion of midterm assessments.