REQUIREMENTS

Semmelweis University Faculty of Dentistry

Name of the course: Physical Foundations of Dental Materials Science

Credit value: 2

Lessons *(in hours)*: 28 **lectures:** 28 **practicals:** **seminars:**

Type of the course: **compulsory** **obligatory elective** **elective**

Frequency of announcement *(per semester or year)*: per year

Academic year: 2020/21 1st. semeter

Subject code[1]:

Lecturer of the course: Zsolt Mártonfalvi, PhD

Contact: Department of Biophysics and Rwdiation Biology,
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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 materiels 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[2]: *(to facilitate credit recognition in other institutions)*

1. **Foundamentals of material structure.**
   Atomic interactions, bonds. Multiatomic systems, gases. Interpretation of temperature, Boltzmann-distribution.
2. Fluids, solids, liquid crystals.
3. Cohesion, adhesion, interfacial phenomena. Phase, phasediagram, phase transitions.
4. Methods for structural examination (diffraction, microscopic, spectroscopic methods)
5. Crystallisation. Metals, alloys, ceramics.
6. Polymers, composites.

7. **Mechanical and other properties of material families.**
   Mechanical properties of materials 1. Elasticity.
8. Mechanical properties of materials 2. Plasticity, hardness.
9. Mechanical properties of materials 3. Rheological properties, viscoelasticity.
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.
14. Physical bases of orthodontics.

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[3]: -

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[4]: 5

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

Type of the exam: writtem semifinal

Requirements of the exam[5]:

1. Atomic interactions, bonds. Multiatomic systems, gases. Interpretation of temperature, Boltzmann-distribution.
2. Fluids, water, liquid crystals.
3. Solis. Crytalline and amorphous materials.
4. Cohesion, adhesion, interfacial phenomena.
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.
9. Physical and mechanical properties of ceramics.
10. Physical and mechanical properties of polymers, composites.
11. Mechanical properties of materials 1: types of deformation, stress-strain diagram. Description of elasticity.
12. Mechanical properties of materials 2: Description of plasticity, hardness.
13. Mechanical properties of materials 3. Fractures, fatigue, impact test
14. Mechanical properties of materials 4. Viscoelasticity.
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.
19. Biomechanics 2. Physical bases of implantology.
20. Biomechanics 3. Physical bases of orthodontics.

Grading of courses[6]: 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.